U.S. ATLAS PROJECT OFFICE

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UPTON, NEW YORK 11973

January 29, 2002

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Dr. Thomas Kirk
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SUBJECT: U.S. ATLAS Project Monthly Status Report for November 2001

Dear Sirs:

Attached please find Monthly Status Report No. 45 for the U.S. ATLAS Project.

Sincerely yours,

Howard A. Gordon
U.S. ATLAS Deputy Project Manager
Head, U.S. ATLAS Project Office

Distribution:

Abolins, M.
Alam, S.
Baker, K.
Barnett, M.
Bensinger, J.
Blair, R.
Butehorn, C.
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Cleland, W.
Crawford, G.
De, K.
Dodd, J.
Ernst, R.
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Kagan, H.
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Kroon, P. – PAP
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U.S. ATLAS

PROJECT STATUS REPORT NO. 45

REPORTING PERIOD

NOVEMBER 2001

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1. PROJECT OBJECTIVE

The U.S. ATLAS Project consists of the activities to design, supply, install and commission the U.S. portion of the ATLAS detector. The detector will become part of the Large Hadron Collider (LHC) at CERN, the European Laboratory for Particle Physics. The ATLAS detector is being designed to understand the dynamics of electroweak symmetry breaking. The U.S. ATLAS collaboration is funded jointly by the U.S. Department of Energy and the National Science Foundation.

The fundamental unanswered problem of elementary particle physics relates to the understanding of the mechanism that generates the masses of the W and Z gauge bosons and of quarks and leptons. To attack this problem, one requires an experiment that can produce a large rate of particle collisions of very high energy. The LHC will collide protons against protons every 25 ns with a center-of-mass energy of 14 TeV and a design luminosity of 10^{34} cm^{-2} s^{-1}. It will probably require a few years after turn-on to reach the full design luminosity.

The detector will have to be capable of reconstructing the interesting final states. It must be designed to fully utilize the high luminosity so that detailed studies of rare phenomena can be carried out. While the primary goal of the experiment is to determine the mechanism of electroweak symmetry breaking via the detection of Higgs bosons, supersymmetric particles or structure in the WW scattering amplitude, the new energy regime will also offer the opportunity to probe for quark substructure or discover new exotic particles. The detector must be sufficiently versatile to detect and identify the final state products of these processes. In particular, it must be capable of reconstructing the momenta and directions of quarks (hadronic jets, tagged by their flavors where possible), electrons, muons, taus, and photons, and be sensitive to energy carried off by weakly interacting particles such as neutrinos that cannot be directly detected. The ATLAS detector will have all of these capabilities.

The ATLAS detector is expected to operate for twenty or more years at the CERN LHC, observing collisions of protons, and recording more than 10^7 events per year. The critical objectives to achieve these goals are:

- Excellent photon and electron identification capability, as well as energy and directional resolution.
- Efficient charged particle track reconstruction and good momentum resolution.
- Excellent muon identification capability and momentum resolution.
- Well-understood trigger system to go from 1 GHz raw interaction rate to ~100 Hz readout rate without loss of interesting signals.
- Hermetic calorimetry coverage to allow accurate measurement of direction and magnitude of energy flow, and excellent reconstruction of missing transverse momentum.
- Efficient tagging of b-decays and b-jets.

The U.S. ATLAS cost objective is $163.75M while supplying initially the work scope described in Appendix 3 of the Project Management Plan (PMP) and, if possible, all the goals described in Appendix 2 of the PMP.

The ATLAS project was initiated in FY 1996, and is scheduled for a 10-year design and fabrication period beginning in the first quarter of FY 1996, and finishing in FY 2005. This period will be followed by operation at the LHC.

2. TECHNICAL APPROACH CHANGES

No change.

3. PROJECT MANAGER'S SUMMARY ASSESSMENT – W. Willis

We continue to see good progress on the systems in production. The next big system to enter into production should be the Silicon Strips, WBS 1.1.2. The progress toward that goal seems very promising. The production of the readout chips proceeds more rapidly that expected, due to a light workload at the vendor. (This is a sign that our other ATMEL devices should be put into production as soon as possible, and we hope to get all the orders in during the next few months.) The news is also very good on the other aspects of the production, with the all the elements now qualified. We hope to see module production in the starting in the first few months of 2002, which we are very anxious to do in order to effect a big reduction in the uncertainty on the use of Contingency.

The progress toward production of the LAr FEB, WBS 1.3.7, also continues to do well, with the first radiation-tolerant boards assembled, with rad-soft voltage regulators plugged in temporarily. We now confidently expect delivery of the last missing component, the negative voltage regulator, in March. The tests should then clear the way for full production.

The other ATMEL order will be for the TRT electronics, ASDBLR, which should have a PRR in the next few months. This will leave the pixel electronics in deep sub-micron as the remaining loose end, and we hope to get feedback from the present submission in the first two months of the New Year.

Our big concern is to get the TRT Barrel Mechanics back in production. The production of unwired chambers is proceeding, but in two to three months, the construction of the authorized number of chambers will be finished. It seems likely that a new wire-joint system will not be qualified by that time. We may hope that it will be decided that a binary gas will be adopted, in which case we may have to stop the chamber assembly line for a time.

4. TECHNICAL PROGRESS - SUBSYSTEM MANGERS' SUMMARIES

1.1 Subsystem Manager's Summary — Abe Seiden (University Of Calif. At Santa Cruz)

1.1.1 Pixels

Work on mechanics is proceeding well. The various parts needed for the disk sectors are moving ahead and initial work toward the pixel support tube has begun. The latter will be made partly of carbon fiber, partly of fiberglass, with the whole package interfaced mechanically and thermally to the SCT. Work continues to try to solve the various integration issues.

The work on the sensors has progressed to the point where the collaboration is ready to begin ordering production sensors. Two viable vendors exist and the target is an initial production of 25% of the sensors. A BCP has been submitted to allow the U.S. contribution to this, which is 20% of the total cost. The first pixel submission to the IBM 0.25-micron process was completed. Six wafers are expected back toward the middle of January, six more a few weeks later. Work is progressing on hybrids and modules, with some acceleration needed on the hybrids to place a new submission by the end of the calendar year.

1.1.2 Silicon Strip System

Delivery of ABCD chips continues at a rapid pace. We now have available 7% of the chips needed to build the full detector. About 10% of the wafers (all made with old epi vendor) yield below 10% and will be sent back. The remaining wafers have a yield just below the 26% level we have based our plans on. We will begin serious testing of wafers using the new epi vendor in December and should have some good statistics on this process late in January. The large I_{dd} current on 6 of the modules we have irradiated is now within spec on all modules due to annealing while being held cold. It appears that the problem is very rate dependent and is likely not to be a problem in the real experiment. To verify this we are irradiating at a low dose a hybrid containing chips from the various lots that had a high I_{dd}. A BCP has been submitted to allow additional purchase of chips.

All components needed for module production are now in production (hybrids, baseboards, chips, detectors) and the Japanese cluster has qualified to start production. The U.S. cluster is making progress with finalizing the tooling and with the baseboard design complete should now be able to focus on completing this. Several electrical modules and mechanical modules were completed to test the tooling and develop the procedures needed for production.

1.1.3 RODs

Work continues on both the VHDL code and the production model cards. In particular significant progress is being made on the Pixel specific VHDL code. This will be needed in March for initial board testing. Production model cards have been fabricated and loaded. Debugging is expected to be complete in late January or early February. These cards will be needed for user evaluation of the ROD in the system test.

1.2 Subsystem Manager's Summary — Harold Ogren (Indiana University)

Component production at Hampton has increased this month, and module production (but not wire stringing) continues at both Duke and Indiana University.

We are actively pursuing solutions to the glass wire joint etching problem. We have instituted several follow up measurements, started a search for alternate wire joints, and begun the study of a binary gas (without CF_4). Until we have resolved the problem and decided on the solution, we have stopped wire joint production at Duke, and halted wire stinging at both assembly sites- Duke and Indiana. We have increased mechanical production during the pause in wire stringing.

Electronics - 1.2.5

The revised metalization ASDBLR wafers were returned by ATMEL and half of them have been packaged in TQFP packages. Using a slightly modified TB3 board we have started to make precision noise measurements of the revised chip. At the moment only one device has been measured, but we know that a) the metal changes to all channels were successful, b) the noise is significantly lower in all channels than the ASDBLR00 version and some channels are better (as expected) than others. While we need to make a lot more measurements (including the strength of the remaining input protection) it is fairly clear that we have understood the basic "cause" of the increased noise and have an array of options from which we can choose a production design.

All DTMROC design effort is concentrated on the DSM version. A final schematic with all blocks final is now in place and a near final layout is converging. Purchase orders from Lund and Penn are already in place and so we might hope for a DSM wafer return in mid March.

We have started to measure the DTMROC01 devices that have just returned from the packager. Preliminary tests seem to indicate that ATMEL did, indeed, improve their process - overall yield has gone from mid 30% to mid 40%.

1.3 Subsystem Manager's Summary Richard Stroynowski (Southern Methodist University)

Steady production progress with no major fires within a sphere of US LAr responsibilities. The continuing delay of end-cap cryostat delivery will impact FCal installation schedule.

The FEB prototype with radiation hard components (minus voltage regulators) has been successfully tested. Voltage regulators will be added early next year. The optical transmitter on Single MUX passed all radiation tests.

G-link chipsets qualified for LHC frequency have been ordered. The cooling plate re-design is ongoing. The re-arrangement of holes and water conduits will allow for standardized cooling plates for all front end boards and will permit for an access to the personality cards without disassembly from FEB.

The production is expected to start early next year. A new task force set up by the electronic coordinator is reviewing the FEB testing program both in the pre-production and in the production stages. This task force will define the number of (unplanned) test stations that will be necessary. Preliminary tests of the new TI64xx DSP look very promising and a decision has been made to proceed with the ROD design with 8 FEB boards processed by each ROD board.

The decision to retrofit the calorimeter modules with the resistor network protection circuit has been made. The production of these circuits was initiated by BNL. The installation is scheduled for April of 2002.

1.4 Subsystem Manager's Summary Lawrence Price (Argonne National Lab.)

Submodule production is now in its final phase. Work continues only at Argonne, focused on redoing and replacing some out-of-spec submodules and on special submodules. 46 modules have been mechanically constructed. Work on the engineering design and analysis of the extended barrel support saddles is continuing. The detailed design of the saddles is complete. An extensive summary of the calculations has been finished in preparation for a PRR to be held in early December. Work on saddle design has now turned to the barrel saddle. The last completely “standard” module, number 47, was completed in November. 41 have been instrumented and tested, and 37 shipped to CERN. All scintillator tiles are now on hand at ANL and MSU. PMT Step 1 (DC) testing continued at UTA, while UI worked to commission Step 2 (pulsed) testing. 3-in-1 card testing continues well, with 91% shipped to CERN. Motherboard testing has come up to speed, with 23% shipped. ITC Submodule production continues on schedule.

1.5 Subsystem Manager's Summary Frank Taylor (MIT)

MDT base chamber production proceeded according to schedule during the month of November. The count is 10 EIS1 (4x6) base chambers glued at the BMC, 13 EMS4 (3x8) chambers at Michigan and 13

EMS2 (3x8) at Seattle of the 16 chambers needed of each type. Both Seattle and Michigan are expected to complete their second series chamber gluing in early January '02. The BMC schedule indicates completion of their series 2 chamber in early March '02. Faraday cage base covers and related parts are being installed in production at all sites and the gas system is being installed in production at Michigan and Seattle.

During November the submission of MDT chamber assembly drawings to the CDD system at CERN was started for the third chamber series. The Brandeis group has started work on defining the location of the survey targets and B-field sensors to be mounted on the chambers.

A study was conducted to investigate the need for glue strips on both the outsides of the MDT chambers. The drawings call for both strips which bind the tubes at their ends near the location of the gas bar and Faraday cages. The strips serve to reduce the distortion of the chamber under pressurization (dimetral expansion of each tube is about 3 microns) and serve as a spacer for the gas bar region of the Faraday cage.

The strips are being installed on the BMC chambers - however it is difficult to implement this feature on the much larger Michigan and Seattle chambers. An FEA calculation of the distortion of the chamber under pressurization was performed by Daly at Seattle which indicated the distortion of the chamber was of order 17 microns without the glue strip and about 8 microns with. Measurements of the effect were made at both Michigan and Brandeis confirming the analysis of Daly. After some discussion it was concluded that the glue strips are not necessary and will not be put on the Michigan and Seattle chambers.

The raw materials for chamber making are being delivered ahead of the critical path. Tubes for the series 4 chambers were delivered well before need. Endplugs however remain close to the critical path and suffered a setback when some of the standard NIEF plugs were found to be defective (twister will not fit) and will have to be sent back. CERN management is well aware of this problem and is addressing it. Another difficulty was encountered in the quality of some of the tubeletts that connect the gas manifold bars to the tubes. The 'Type 3' were found to leak at about the 2 % level. The vendor has been informed and a QA program is underway at Brandeis to supply the US MDT production sites with (clean) and leak tight tubes.

Good progress was made on the endcap alignment system at Brandeis. Component fabrication is ahead of the chamber critical path and all parts for the second chamber series have been delivered to the sites and the fabrication has started for the third series. An interesting lesson was learned at the H8 test site. It was found that a diffraction pattern and CCD surface conspired to make a centroid variation as the image was moved across the surface of the CCD. A fix was found by changing the focal point of the BCAM from 1.5 meters to 4 meters.

Several members of the US Muon participated in the Big Wheel (BW) Review held at CERN in mid November. In general the BW design has advanced and, with some clean-up work completed, will be ready for submission for tender. One of the recommendations is to perform a validation of FEA deflection calculations on the prototype sector in H8. These are now in progress.

One CSC base chamber has been constructed at BNL. The critical technical issue of making flat panels is solved with contributions of good material from industry and a fabrication technique at BNL. Parts are on hand for 4 base chambers. All cathode panels for these 4 chambers are being surveyed on a CMM to verify spatial tolerance. Progress was made on the ASMI and ASMIIb designs and the setup of a large test bed for the CSC electronics was stared. Coding of the SPU C and assembly code continued at UCI. An internal review of CSC production was held at BNL on Nov. 15.

1.6 Subsystem Manager's Summary — Robert Blair (Argonne National Lab.)

There was a very productive TDAQ workshop at NIKHEF early in November. The plans for testbeds have become clearer. There was a consensus that a small addition to the hardware already present at CERN would provide an adequate system for the initial integration and performance measurements.

An area which is more contentious was discussed, but needs to be resolved, is the issue of ROB on ROD. At NIKHEF there appeared to be a consensus that this approach would have a number of benefits, but there were some that felt that it was being raised too late. The architecture of a ROB on ROD system has become clearer and looks to be practical. The concept would allow for a minimum of custom hardware and a heavy use of commodity items like network switches and interfaces. The "link source card" built at Argonne should make it easy for proponents to test out some of the ideas. In the meantime a task force will be formed to review whether further movement in this direction is desirable or a waste of time and resources.

Initial versions of the dataflow software are now in the repository and the integration of the pieces will proceed in December.

1.10 Technical Coordination — David Lissauer (Brookhaven National Laboratory)

Technical Management Board Meeting
The Technical Management Board held discussions regarding different parts of the ATLAS experiment. Among the many items discussed were:

Shielding
V. Hedberg presented an update on the shielding design. A lot of effort has been invested in the last three months to optimize and simplify the shielding design. Major modification and simplifications have been made to the JF shield that will save literally millions of Swiss franks. The overall weight has been reduced by 300 tons and the geometry vastly simplified.

Experimental Hall
The ATLAS excavation of the experimental hall is going well. The hall has been excavated past the beam line level, and we are now finalizing the floor layout. An option to increase the trench size to simplify the truck movement has been proposed and the civil engineers will take a look at it. If this works out, it will simplify the access movement and the steps needed.

Placement Requirements
I gave a summary of the work done with Christian Lasseur in establishing the ATLAS placement and survey strategy. There has been quite a lot of progress in the last few months. Working groups have been established and coordinators selected for each of the ATLAS assemblies in the Hall. Discussions with the machine on machine experiment interface have started. There are some positive steps that the machine people are willing to take to help in the alignment of the beam relative to the experiments.

Toroid Installation

The Barrel Toroid installation is being revisited now. The present schedule calls for installation in a period of six months, which seems to be very aggressive. A more detailed study is underway to establish a more realistic installation schedule. It will probably call for a 9-12 month installation time.

5. OPEN ITEMS BETWEEN DOE/NSF AND U.S. ATLAS

a) Financial: There is $231,000 of available funding residing in management reserve, $5,150,000 available in available contingency and $17,892,000 of undistributed budget authority, pending completion and approvals of FY 02 Institutional MOU's. Table 7-2 contains the summary of FY02 funds distribution. There was $36,900 requested in additional funding allocations during November and an adjustment of $24,000 to Silicon Funds Authorized to correct FY00 actual funding. The funding was allocated in FY00, but not properly accounted for in the allocation totals.

b) Schedule: None.

c) Technical: None.

6. SUMMARY ASSESSMENT AND FORECAST

1. Financial Status

A total of $119,445,000 (72.9%) was authorized, held in reserve or identified as undistributed budget of the $163.75M Total Project Cost Objective. The details of the overall project cost objective are presented in Table 6-1 reproduced overleaf from the U.S. ATLAS Project Plan as approved on 3/18/98 and revised to include cost changes approved through BCP # 49.

The details of the reported costs and reported obligations are presented in the Table 7-1 in Section 7 of this report. Note Silicon funding authorized includes an additional $24k of funding to University of New Mexico during fiscal year 2000 that had not been previously recorded. In addition Table7-2 shows the fiscal year 2002 funding allocation by institution and funding source.

The relationship between budget authority/cost/obligations (including an estimate of other accrued costs and obligations) is presented in Figure 9-1 in Section 9 of this report.

The level 2 CSSR statistics are presented in section 10. Performance analysis is included for major subsystems in section 8 of this report.

2. Schedule Status

See details in Figure 11-1.

The overall schedule status report is found in section 11.

The milestone log from the PMP, including revised forecast dates, is reproduced as section 12.

3. Baseline Change Proposals

Fifty BCPs were received through November 2001. Forty-seven BCP's were approved, one is pending approval and two were withdrawn.

Table 6-1 reflects cost changes through BCP # 49.

TABLE 6-1: SUMMARY COST ESTIMATE

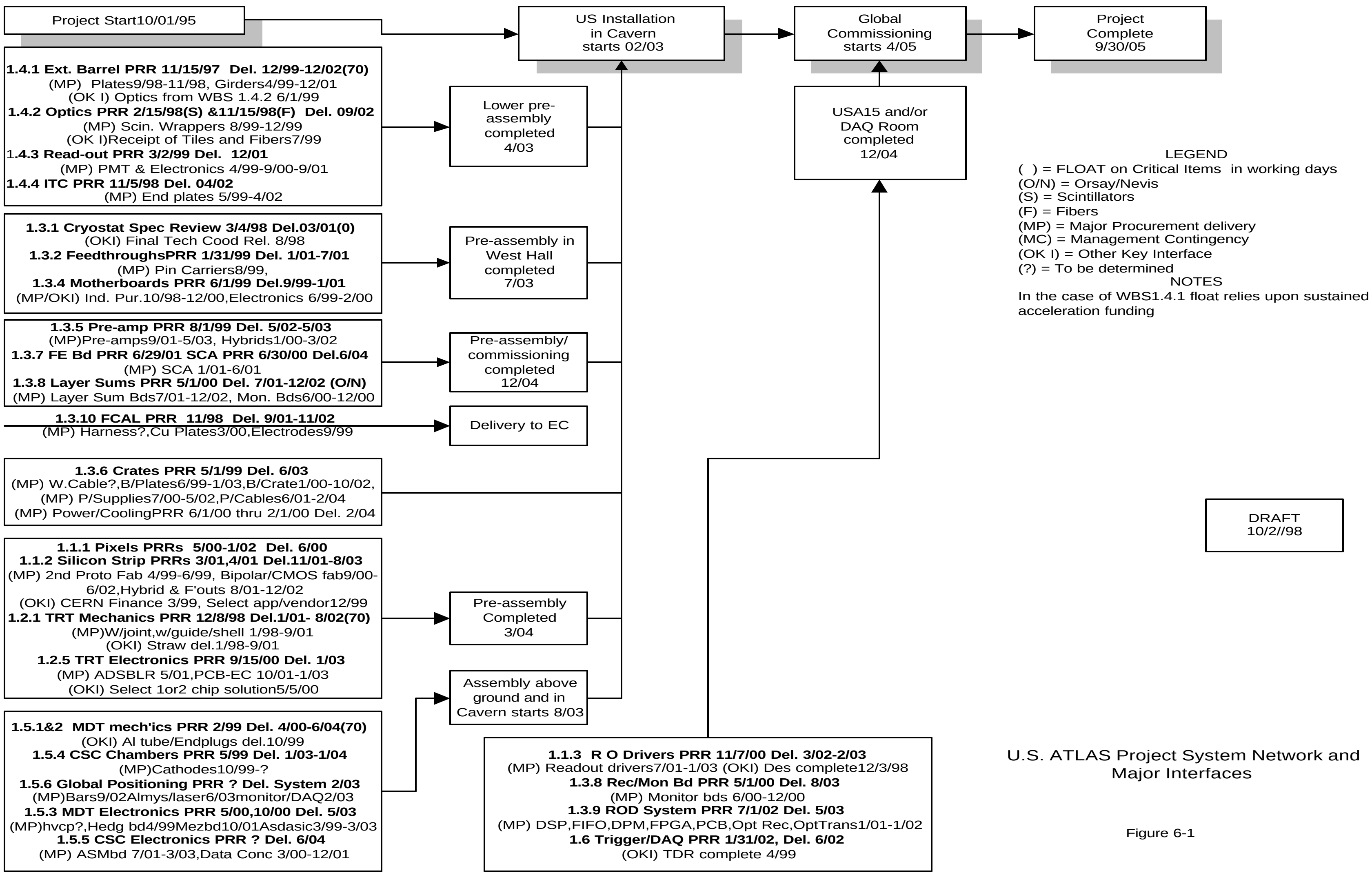
U.S.ATLAS Project
Summary Cost Estimate

Presented in (AY$ x 1000)

WBS No.	Description	Base Cost
	Technical Baseline	
1	U.S. ATLAS	
1.1	Silicon	17,795.3
1.2	TRT	9,194.0
1.3	LAr Calorimeter	43,771.7
1.4	Tile Calorimeter	9,290.2
1.5	Muon Spectrometer	26,391.2
1.7	Common Projects	9,179.1
1.8	Education	286.5
1.9	Project Management	8,279.0
1.10	Technical Coordination	450.0
	Subtotal	**124,637.0**
1.6	Trigger/DAQ Pre-Technical Baseline	3,117.9
	Subtotal	**3,117.9**
	Management Contingency	**8,709.7**
	Contingency	**19,446.0**
	Subtotal	**28,155.6**
	Technical Baseline	**155,910.5**
Items Outside of Approved Technical Baseline		
1.1.1	Pixels	-
1.6	Trigger/DAQ	**7,839.5**
	Subtotal	**7,839.5**
	Total Project Cost**	**163,750.0**

** Assumes funding profile of FY96=$1.7M, FY97=$3.7M, FY98=$10.05M,, FY99=$25.63 FY00=$28.4M, FY01=$26.8M, FY02=$23.2M, FY03=$24.7M,FY04=$14.7M, FY05=$4.9M.
project completion in 2005.
Includes cost changes for BCP 1-49.

Figure 6-1 - Project System Network



FUNDING

Table 7.1 - Summary of Funds Authorized & Total Costs and Commitments to Date

U.S. ATLAS Project
Summary of Funds Authorized
and
Total Costs and Commitments to Date
November 30, 2001
(AY$ x 1,000)

WBS No.	Description	Funds Authorized Thru FY02	Expenses + Commitments: Expenses to Date	Open Commit	Total to Date	Balance of Authorized Funds
1.1	Silicon	13,659	9,992	104	10,096	3,563
1.2	TRT	7,473	5,744	1,268	7,012	461
1.3	LAr Calorimeter	31,964	24,201	3,110	27,310	4,654
1.4	Tile Calorimeter	9,175	7,960	71	8,031	1,144
1.5	Muon Spectrometer	17,673	14,532	159	14,690	2,983
1.6	Trigger/DAQ	2,310	1,767	1	1,768	542
1.7	Common Projects	7,269	7,101	-	7,101	168
1.8	Education	49	55	-	55	(6)
1.9	Project Management	6,150	4,905	17	4,923	1,227
1.10	Technical Coordination	450	328		328	122
	Subtotal	96,172	76,584	4,729	81,313	14,859
	Management Reserve	231			-	231
	Contingency	5,150			-	5,150
	Subtotal	101,553	76,584	4,729	81,313	20,240
	Undistributed Budget	17,892			-	17,892
1	U.S. ATLAS Total AY$	119,445	76,584	4,729	81,313	38,132

Table 7.2 – FY01 Funds – U.S. ATLAS Summary by Institution and Subsystem

U.S. ATLAS

FY 02 Funds

WBS 1 U.S. ATLAS Summary

Presented in (AY$x1,000)

Status as of 11/30/01

	WBS 1.1 Silicon			WBS 1.2 TRT			WBS 1.3 Liquid Argon			WBS 1.4 Tile			WBS 1.5 Muon		
	DOE		NSF	DOE		NSF	DOE		NSF	DOE		NSF	DOE		NSF
Institution	Grant	Contract		Grant	Contract		Grant	Contract		Grant	Contract		Grant	Contract	
ANL											158				
BNL								1,000						445	
LBNL		1,500													
SUNY/Albany															
Arizona															
Boston University															
Brandeis University															
UC Irvine															
UC Santa Cruz															
U of Chicago															
Duke University															
Hampton University															
Harvard University															
U of Illinois															
Indiana University															
MIT															
Michigan State U															
Nevis/Columbia															
New Mexico		37													
North Illinois U															
Ohio State University															
U of Michigan															
U of Oklahoma *															
U of Pennsylvania															
U of Pittsburg															
U of Rochester															
UT- Arlington															
Southern Methodist U															
SUNY/Stony Brook															
Tufts University															
U of Washington															
U of Wisconsin															
Total FY01	-	1,537	-	-	-	-	-	1,000	-	-	158	-	-	445	-
Reserve			-	-		-			-	-		-			
Contingency															
Total FY01	-	1,537	-	-	-	-	-	1,000	-	-	158	-	-	445	-

	WBS 1.6 Trigger/DAQ			WBS 1.7 Common Projects			WBS 1.8 Education		WBS 1.9 Proj Mgmt			WBS 1.10 Tech Coord			WBS 1 U.S. ATLAS Total FY01			
	DOE		NSF	DOE		NSF	DOE	NSF	DOE		NSF	DOE		NSF	DOE		NSF	
Institution	Grant	Contract		Grant	Contract				Grant	Contract		Grant	Contract		Grant	Contract		Total
ANL		233													-	391	-	391
BNL										700					-	2,145	-	2,145
LBNL															-	1,500	-	1,500
SUNY/Albany															-	-	-	-
Arizona															-	-	-	-
Boston University															-	-	-	-
Brandeis University															-	-	-	-
UC Irvine															-	-	-	-
UC Santa Cruz															-	-	-	-
U of Chicago															-	-	-	-
Duke University															-	-	-	-
Hampton University															-	-	-	-
Harvard University															-	-	-	-
U of Illinois															-	-	-	-
Indiana University															-	-	-	-
MIT															-	-	-	-
Michigan State U															-	-	-	-
Nevis/Columbia															-	-	-	-
New Mexico															-	37	-	37
North Illinois U															-	-	-	-
Ohio State University															-	-	-	-
U of Michigan															-	-	-	-
U of Oklahoma *															-	-	-	-
U of Pennsylvania															-	-	-	-
U of Pittsburg															-	-	-	-
U of Rochester															-	-	-	-
UT- Arlington															-	-	-	-
Southern Methodist U															-	-	-	-
SUNY/Stony Brook															-	-	-	-
Tufts University															-	-	-	-
U of Washington															-	-	-	-
U of Wisconsin															-	-	-	-
Total FY01	-	233	-	-	-	-	-	-	-	700	-	-	-	-	-	4,073	-	4,073
Reserve		-	-		-					-	-		-	-	-	-	-	-
Contingency										-	-		-	-	-	-	-	-
Total FY01	-	233	-	-	-	-	-	-	-	700	-	-	-	-	-	4,073	-	4,073

* correction of prior month record of 426 to 49

8. PERFORMANCE ANALYSIS

Status through the month of November 2001 reflects the baseline schedules established on October 1, 2000. Effort is currently ongoing to re-baseline the schedules based on a new bottom up estimate. In order to focus on the re-baseline effort this month's status has been treated as level of effort where BCWS and BCWP were incremented by the increase in ACWP.

The CSSR in section 10 shows $81,312.9k of the work has been performed, which represents approximately 63.6% of the work authorized to date. There is an unfavorable schedule variance of ($1,697.8k) or 2.0% behind the plan. There is a favorable cost variance of $4,728.9k or 5.8% under spent for the work accomplished. This jump in the favorable cost variance is the result of the basic planning approach where material dollars are lumped in planning packages at the end of the fiscal year, then, when orders are placed these dollars are moved to the period when material payments will be made. In situations where tasks are behind schedule the money or material costs were lower than planned this left over money adds to a positive cost variance. There are outstanding commitments of $4,729.1k at this time that do not show up in the performance. This analysis will provide a breakdown of these variances into the individual subsystems and identify the specific tasks that cause these variances.

WBS 1.1 Silicon

Summary
The CSSR shows that $10,771.9k of the work has been completed which represents 60.5% of the total effort for the Silicon subsystem. There is an unfavorable schedule variance of ($354.8k) or 3.2% behind the plan and a favorable cost variance of $780.3k or 7.2% under spent for the work accomplished. There are outstanding commitments of $104.4k at this time that do not show up in the performance.

Schedule Variance
The unfavorable schedule variance is concentrated in the following WBS level 3 elements:

WBS 1.1.3 RODs SV = ($284.0k)

- Design ROD Cards is behind plan ($6.1k)
- ROD Test Stand is behind plan ($21.3k)
- ROD Prototypes is behind plan ($25.6k)
- ROD Prototype Evaluation is behind plan ($40.4k)
- ROD Production Model is behind plan ($81.7k)
- ROD Fabrication is behind plan ($108.8k)

Cost Variance
There is a favorable cost variance of $780.3k which is distributed as follows: Pixel $196.62k, the Silicon Strip System $756.3k and the ROD Design and Fabrication ($172.5k).

WBS 1.2 TRT

Summary
The CSSR shows that $6,662.6k of the work has been completed which represents 72.5% of the total effort for the TRT subsystem. There is an unfavorable schedule variance of ($462.1k) or 6.5% behind the

plan and a favorable cost variance of $918.7k or 13.8% under spent for the work accomplished. There are outstanding commitments of $1268.0k at this time that do not show up in the performance.

Schedule Variance
The unfavorable schedule variance is concentrated in the following WBS level 3 elements

WBS 1.2.1 Barrel Mechanics SV = ($461.0k)

- Detector Elements are behind plan ($243.8k)
- Component Assembly is behind plan ($78.2k)
- Module Assembly #2 (Duke) is behind plan ($78.2k
- Module Assembly #1 (IU) is behind plan ($59.8k)

Cost Variance
There is a favorable cost variance of $918.7k that is distributed as follows: Barrel Mechanics $662.4k and TRT Electronics $256.3k.

WBS 1.3 LAr

Summary
The CSSR shows that $26,484.5k of the work has been completed which represents 60.5% of the total effort for the LAr subsystem. There is an unfavorable schedule variance of ($590.4k) or 2.2% behind the plan and a favorable cost variance of $2,283.9k or 8.6% under spent for the work accomplished. There are outstanding commitments of $3,109.6k at this time that do not show up in the performance.

Schedule Variance
The unfavorable schedule variance is concentrated in the following WBS level 3 elements:

WBS 1.3.1 Barrel Cryostat SV = ($154.7k)
WBS 1.3.2 Feedthroughs SV = ($98.4k)
WBS 1.3.7 Front End Board SV = ($169.4k)
WBS 1.3.10 Forward Calorimeter SV = ($81.6k)

Cost Variance
The favorable cost variance of $2,283.9k is a combination of positive and negative variances concentrated in the following WBS Level 3 elements.

- 131 Barrel Cryostat CV = $307.9k
- 132 Feedthroughs CV = ($172.1k)
- 133 Cryogenics CV = $636.7k
- 134 Readout Electrodes/MB CV = $434.1k
- 135 Preamp/Calibration CV = $278.3k
- 136 System Crate Integration CV = $465.2k
- 137 Front End Board CV = ($153.0k)
- 139 ROD System CV = $145.6k
- 1310 Forward Calorimeter CV = $230.6k

WBS 1.4 Tile

Summary

The CSSR shows that $8,667.1k of the work has been completed which represents 93.3% of the total effort for the Tile subsystem. There is an unfavorable schedule variance of ($51.1k) or 0.6% behind the plan and a favorable cost variance of $707.2k or 8.2% under spent for the work accomplished. There are outstanding commitments of $70.7k at this time that do not show up in the performance.

Schedule Variance

The unfavorable schedule variance is concentrated in the following WBS level 3 elements:

WBS 1.4.4 Intermediate Tile Calorimeter SV = ($48.4k)

- Scintillator Preparation is behind plan ($17.4k)
- Cryostat Scintillators are behind plan ($26.2k)

Cost Variance

There is a favorable cost variance of $707.2k which is distributed as follows:

- 141 EB Mechanics $28.0k
- 142 EB Optics ($51.9k)
- 143 Readout $214.9k
- 144 ITC $516.1k

WBS 1.5 Muon

Summary

The CSSR shows that $14,444.7k of the work has been completed which represents 54.7% of the total effort for the Muon subsystem. There is an unfavorable schedule variance of ($154.6k) or 1.1% behind the plan and an unfavorable cost variance of ($87.2k) or 0.6% over spent for the work accomplished. There are outstanding commitments of $158.5k at this time that do not show up in the performance.

Schedule Variance

The unfavorable schedule variance is concentrated in the following WBS level 3 elements:

WBS 1.5.7 MDT Chambers SV = ($46.7k)

- Special Chamber Integration Drawings ($16.3k)
- Common Procurements ($9.9k)
- Chamber Construction ($20.2k)

WBS 1.5.8 MDT Supports SV = ($81.9k)

- Chamber Mount Struts Design is behind plan ($28.8k)
- Integration with Support Structure Design is behind plan ($36.5k)
- Chamber Mount Struts are behind plan ($12.9k)

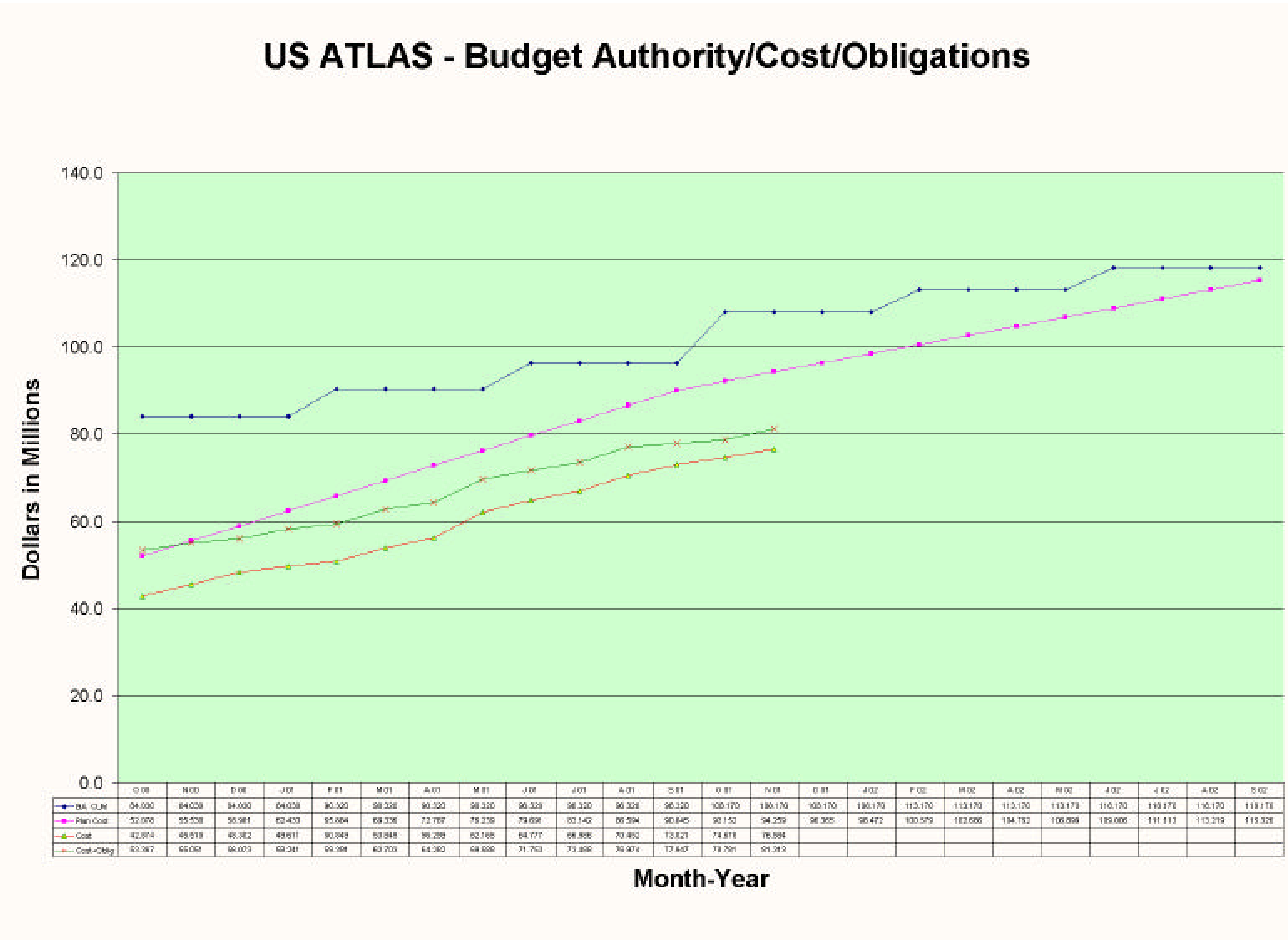
Cost Variance
The unfavorable cost variance of $87.2k is a combination of positive and negative variances concentrated in the following WBS Level 3 elements.

- 154 CSC Chambers CV = $116.9k
- 157 MDT Chambers CV = ($110.5k)
- 158 MDT Supports CV = ($98.0k)
- 159 MDT Electronics CV = $403.8k
- 1511 CSC Electronics CV = ($144.3k)
- 1512 Global Align System CV = ($255.20k)

WBS 1.6 Trigger/DAQ

Summary
The CSSR shows that $1,893.3k of the work has been completed which represents 60.7% of the total effort for the Trigger/DAQ subsystem. There is an unfavorable schedule variance of ($84.7k) or 4.3% behind the plan and a favorable cost variance of $126.1k or 6.7% under spent for the work accomplished. There are unfavorable cost variances of ($93.9k) for the Level 2 Supervisor and ($0.9k) for Architecture, but, these are offset by favorable cost variances of $146.0k.8k for the Level 2 Calorimeter Trigger and $74.9k for the Level 2 SCT Trigger. There are outstanding commitments of $0.5k at this time that do not show up in the performance.

9. BUDGET AUTHORITY COSTS AND OBLIGATIONS



10. WBS – COST SCHEDULE STATUS REPORT

Project Status Report
Section 10

U.S. ATLAS

Cost Schedule Status Report

Reporting Period Ending: 11/30/01

		Cumulative To Date (k$)					At Completion (k$)			Complete (%)		
		Budgeted Cost		Actual Cost	Variance			Latest				
	WBS Element	Work Scheduled	Work Performed	Of Work Performed	Schedule	Cost	Budgeted AY $s	Revised Estimate	Variance	Scheduled	Performed	Actual
1.1	Silicon	11,126.7	10,771.9	9,991.6	(354.8)	780.3	17,795.3	17,795.3	-	62.5	60.5	56.1
1.2	TRT	7,124.7	6,662.6	5,743.9	(462.1)	918.7	9,194.0	9,194.0	-	77.5	72.5	62.5
1.3	Liquid Argon	27,074.9	26,484.5	24,200.6	(590.4)	2,283.9	43,771.7	43,771.7	-	61.9	60.5	55.3
1.4	TileCal	8,718.1	8,667.1	7,959.9	(51.1)	707.2	9,290.2	9,290.2	-	93.8	93.3	85.7
1.5	Muon	14,599.3	14,444.7	14,531.9	(154.6)	(87.2)	26,391.2	26,391.2	-	55.3	54.7	55.1
1.6	Trigger/DAQ	1,978.1	1,893.3	1,767.3	(84.7)	126.1	3,117.9	3,117.9	-	63.4	60.7	56.7
1.7	Common Projects [1]	7,101.1	7,101.1	7,101.1	-	-	9,179.1	9,179.1	-	77.4	77.4	77.4
1.8	Education [1]	54.6	54.6	54.6	-	-	286.5	286.5	-	19.1	19.1	19.1
1.9	Project Management [1]	4,905.4	4,905.4	4,905.4	-	-	8,279.0	8,279.0	-	59.3	59.3	59.3
1.10	Technical Coordination	327.8	327.8	327.8	-	-	450.0	450.0	-	72.8	72.8	72.8
Sub Total		83,010.7	81,312.9	76,584.1	(1,697.8)	4,728.9	127,754.9	127,754.9	-	65.0	63.6	59.9
Management Reserve							0.0	0.0	-			
Contingency							19,446.0	19,446.0	-			
Management Contingency							8,709.7	8,709.7	-			
Items Outside of Approved Baseline							7,839.5	7,839.5	-			
Escalation							0.0	0.0	-			
U.S. ATLAS Total		83,010.7	81,312.9	76,584.1	(1,697.8)	4,728.9	163,750.0	163,750.0	-	50.7	49.7	46.8

Notes: 1 LOE

FIGURE 11-1 - MILESTONE SCHEDULE STATUS REPORT

ID	Subsystem ID	Milestone	ETC 01 Baseline	Forecast	Actual
1		Project Start (10/1/95)	Sun 10/1/95	Sun 10/1/95	Sun 10/1/95
2	Tile L2/1	Start Submodule Procurement	Mon 9/1/97	Mon 9/1/97	Mon 9/1/97
3	Tile L2/2	Technology Choice for F/E Electronics	Sat 11/15/97	Sat 11/15/97	Sat 11/15/97
4	LAr L2/1	Cryostat Contract Award	Fri 7/24/98	Wed 8/5/98	Wed 8/5/98
5	LAr L2/2	Barrel FTs Final Design Review	Wed 9/30/98	Fri 10/2/98	Fri 10/2/98
6	TRT L2/1	Final Design Complete	Thu 12/31/98	Mon 12/7/98	Mon 12/7/98
7	LAr L2/4	FCAL Mech Design Complete	Mon 12/14/98	Wed 12/15/99	Wed 12/15/99
8	Tile L2/3	Start Module Construction	Sat 5/1/99	Mon 9/20/99	Mon 9/20/99
9	TDAQ L2/1	Select Final LVL2 Architecture	Fri 12/31/99	Fri 3/31/00	Fri 3/31/00
10	LAr L2/3	Start Elec.'s Production (Preamps)	Fri 6/30/00	Fri 6/30/00	Fri 6/30/00
11	Muon L2/1	Start MDT Chambers Lines 1 & 3	Mon 7/17/00	Fri 9/15/00	Fri 9/15/00
12	Muon L2/6	Kinematic Mount Design Complete	Tue 1/30/01	Tue 1/30/01	Tue 1/30/01
13	Tile L2/4	Start Production of MBs	Sun 4/1/01	Fri 3/30/01	Fri 3/30/01
14	LAr L2/9	Cryostat Arrives at CERN	Tue 5/15/01	Mon 7/2/01	Mon 7/2/01
15	TRT L2/4	Select Final Elec Design	Fri 6/15/01	Wed 8/30/00	Wed 8/30/00
16	Sil L2/1	Start Full Silicon Strip Elec Production	Fri 7/6/01	Sun 7/15/01	Sun 7/15/01
17	Sil L2/6	Pixels '1st IBM Prototype Submitted'	Thu 7/26/01	Mon 11/12/01	**Mon 11/12/01**
18	Muon L2/2	Start CSC Chamber Production	Sat 9/1/01	Mon 10/1/01	Mon 10/1/01
19	Sil L2/3	ROD Design Complete	Mon 10/1/01	Wed 4/17/02	NA
20	LAr L2/6	Level 1 Trigger Final Design Complete	Thu 10/4/01	Sat 3/30/02	NA
21	Muon L2/3	MDT Electronics ASD PRR	Fri 10/19/01	Thu 1/31/02	NA
22	Sil L2/2	Start Full Strip Module Production	Mon 1/7/02	Fri 3/15/02	NA
23	TRT L2/5	Start Production of ASICS	Fri 1/18/02	Fri 1/18/02	NA
24	LAr L2/10	Barrel FTs Production Complete	Fri 2/15/02	Sat 6/1/02	NA
25	Muon L2/4	Final Design of Global Align Devices	Mon 4/1/02	Mon 4/1/02	NA
26	Muon L2/5	CSC IC Production Complete	Wed 5/15/02	Wed 5/15/02	NA
27	LAr L2/8	MB System Production Complete	Sun 6/30/02	Sun 6/30/02	NA
28	TDAQ L2/3	LVL2 Trigger Prototype Complete	Mon 9/30/02	Mon 9/30/02	NA
29	Tile L2/6	Module Construction Complete	Mon 9/30/02	Mon 9/30/02	NA
30	Tile L2/5	All Elec.'s Components Delivered to ATLAS	Tue 10/1/02	Tue 10/1/02	NA
31	LAr L2/11	FCAL-C Delivered to EC	Thu 10/17/02	Thu 10/17/02	NA
32	Tile L2/7	All Modules Delivered to CERN	Mon 12/2/02	Mon 12/2/02	NA
33	LAr L2/7	ROD Final Design Complete	Thu 12/12/02	Thu 12/12/02	NA
34	TDAQ L2/2	LVL2 Trigger Design Complete	Tue 12/31/02	Tue 12/31/02	NA
35	TDAQ L2/4	Start Production	Wed 1/8/03	Wed 1/8/03	NA
36	TDAQ L2/5	Start Installation & Commissioning	Wed 3/5/03	Wed 3/5/03	NA
37	Muon L2/10	MDT Elec.'s Mezz Production Complete	Thu 3/6/03	Thu 3/6/03	NA
38	Sil L2/7	Pixels 'Start IBM Production'	Thu 3/13/03	Thu 3/13/03	NA
39	TRT L2/2	Module Production Complete (CUM 102)	Mon 3/31/03	Mon 3/31/03	NA
40	Sil L2/5	ROD Production/Testing Complete	Tue 6/24/03	Tue 6/24/03	NA
41	TRT L2/3	Barrel Construction Complete	Tue 9/16/03	Tue 9/16/03	NA
42	Sil L2/4	Compl Shipment of Silicon Strip Modules Prod	Mon 10/13/03	Mon 10/13/03	NA
43	Sil L2/8	Pixels 'Start IBM Outer Bare Module Prod'	Wed 10/22/03	Wed 10/22/03	NA
44	Muon L2/9	CSC ROD Production Complete	Wed 11/5/03	Wed 11/5/03	NA
45	LAr L2/12	FCAL-A Delivered to EC	Mon 12/8/03	Mon 12/8/03	NA
46	Muon L2/8	Kinematic Mount Production Complete	Mon 5/24/04	Mon 5/24/04	NA
47	Muon L2/7	MDT Chambers (U.S.) Prod Compl (Qty. 240)	Fri 8/27/04	Tue 9/14/04	NA
48	Muon L2/12	Global Align System Final Delivery	Thu 9/30/04	Thu 9/30/04	NA
49	Sil L2/9	Pixels 'Disk System at CERN'	Wed 10/13/04	Wed 10/13/04	NA
50	Muon L2/11	CSC Assembly/Test at CERN Complete	Fri 12/17/04	Fri 12/17/04	NA
51	TRT L2/6	Installation Complete	Tue 1/4/05	Tue 1/4/05	NA
52	TDAQ L2/6	Production Complete	Sat 7/30/05	Sat 7/30/05	NA
53	TDAQ L2/7	Installation & Commissioning Complete	Fri 9/30/05	Fri 9/30/05	NA

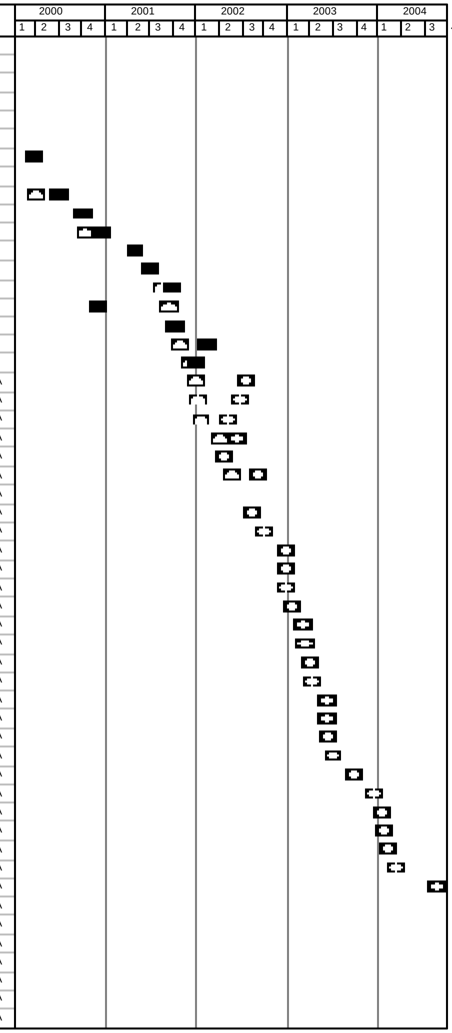
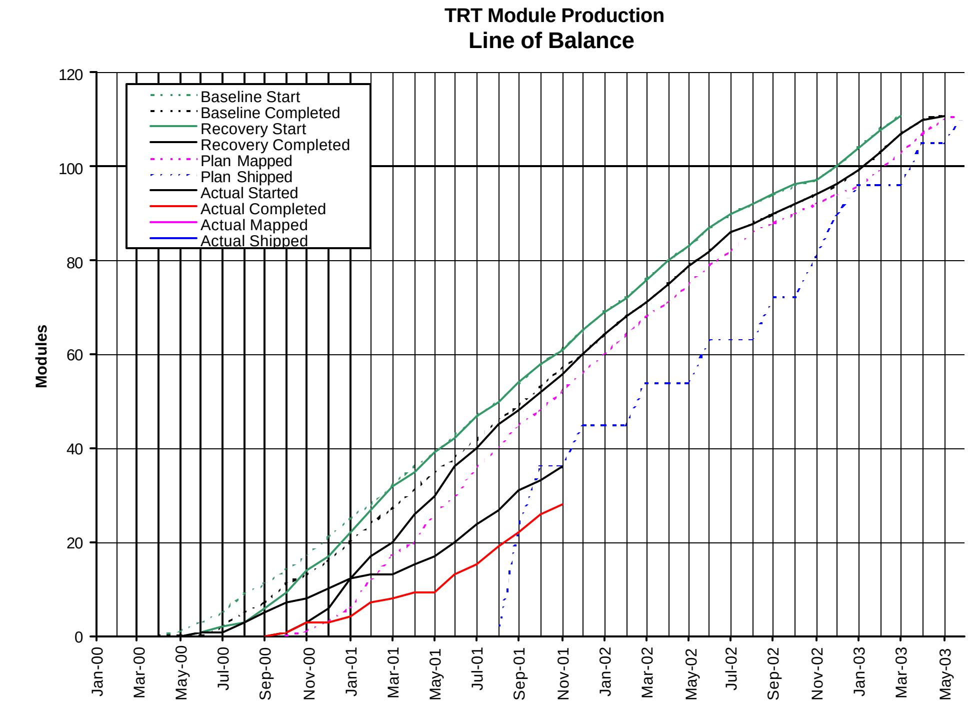
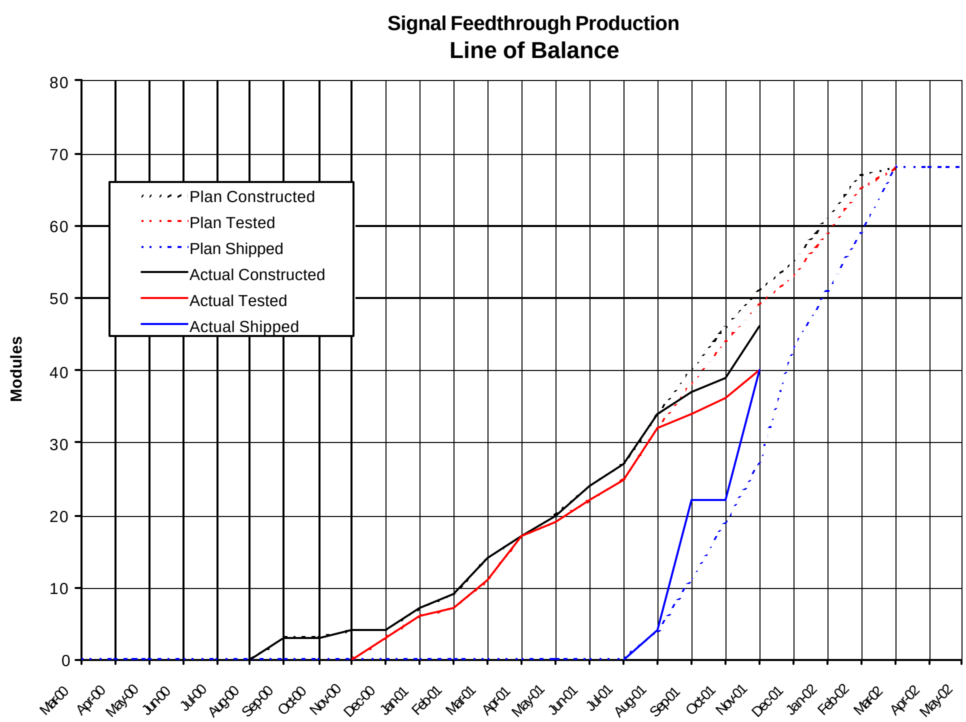
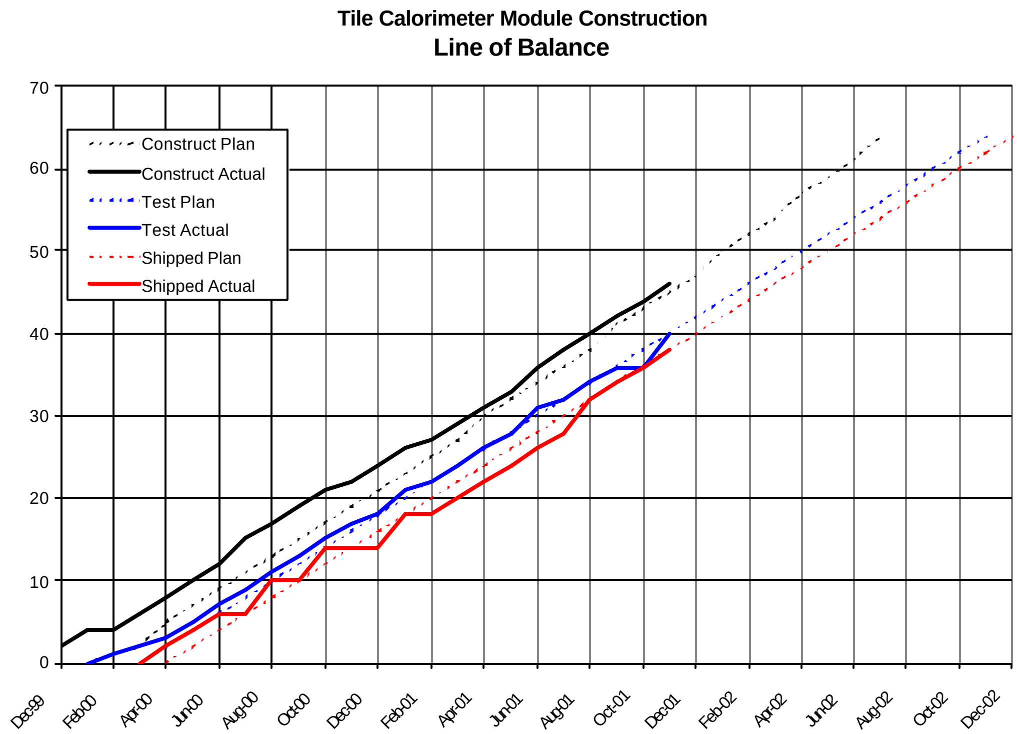


FIGURE 11-2 - LINE OF BALANCE THROUGH NOVEMBER 2001






Tile Calorimeter Module Construction
Line of Balance
Construct Plan
Construct Actual
Test Plan
Test Actual
Shipped Plan
Shipped Actual
70
60
50
40
30
20
10
0
Dec-99
Feb-00
Apr-00
Jun-00
Aug-00
Oct-00
Dec-00
Feb-01
Apr-01
Jun-01
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Oct-01
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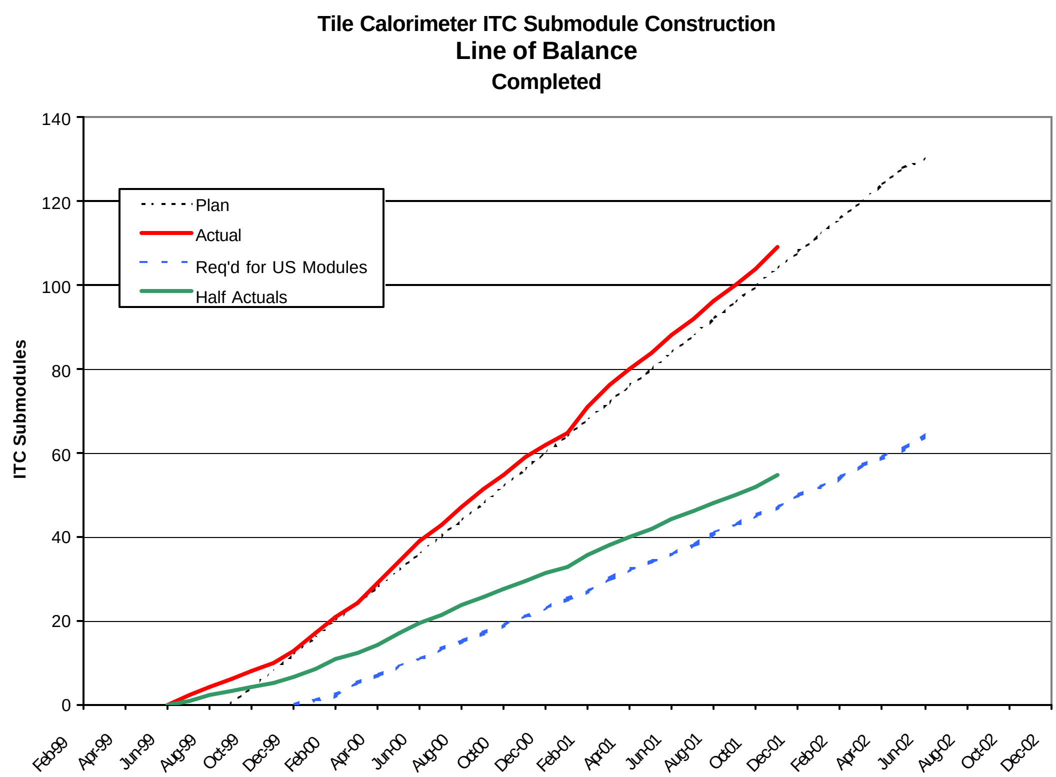
Aug-02
Oct-02
Dec-02


Tile Calorimeter ITC Submodule Construction
Line of Balance
Completed
ITC Submodules
Plan
Actual
Req'd for US Modules
Half Actuals
140
120
100
80
60
40
20
0
Feb-99
Apr-99
Jun-99
Aug-99
Oct-99
Dec-99
Feb-00
Apr-00
Jun-00
Aug-00
Oct-00
Dec-00
Feb-01
Apr-01
Jun-01
Aug-01
Oct-01
Dec-01
Feb-02
Apr-02
Jun-02
Aug-02
Oct-02
Dec-02

12. MILESTONE LOG

The milestones have been updated with the new ETC 01 baseline dates.

U.S. ATLAS Major Project Milestones (Level 1)

Description	Baseline Schedule	Forecast (F) Date	Actual (A) Date
Project Start	01-Oct-95	01-Oct-95 (F)	01-Oct-95 (A)
Project Completion	30-Sep-05	30-Sep-05 (F)	

U.S. ATLAS Major Project Milestones (Level 2)

Subsystem	**Schedule Designator**	**Description**	**Baseline Schedule**	**Forecast (F) / Actual (A) Date**
Silicon (1.1)	SIL L2/1	Start Full Silicon Strip Electronics Production	06-Jul-01	15-Jul-01 (A)
	SIL L2/2	Start Full Strip Module Production	07-Jan-02	15-Mar-02 (F)
	SIL L2/3	ROD Design Complete	01-Oct-01	17-Apr-02 (F)
	SIL L2/4	Complete Shipment of Silicon Strip Module Production	13-Oct-03	13-Oct-03 (F)
	SIL L2/5	ROD Production/Testing Complete	24-Jun-03	24-Jun-03 (F)
	SIL L2/6	Pixels 1st IBM Prototype Submitted	26-Jul-01	**12-Nov-01 (A)**
	SIL L2/7	Pixels Start IBM Production	13-Mar-03	13-Mar-03 (F)
	SIL L2/8	Pixels Start IBM Outer Bare Module Prod	22-Oct-03	22-Oct-03 (F)
	SIL L2/9	Pixels Disk System at CERN	13-Oct-04	13-Oct-04 (F)
TRT (1.2)				
Mechanical	TRT L2/1	Final Design Complete	31-Dec-98	07-Dec-98 (A)
	TRT L2/2	Module Production Complete (CUM 102)	31-Mar-03	31-Mar-03 (F)
	TRT L2/3	Barrel Construction Complete	16-Sep-03	16-Sep-03 (F)
Electrical	TRT L2/4	Select Final Elec Design	15-Jun-01	30-Aug-00 (A)
	TRT L2/5	Start Production of ASICS	18-Jan-02	18-Jan-02 (F)
	TRT L2/6	Installation Complete	04-Jan-05	04-Jan-05 (F)
LAr Cal (1.3)	LAr L2/1	Cryostat Contract Award	24-Jul-98	05-Aug-98 (A)
	LAr L2/2	Barrel Feedthroughs Final Design Review	30-Sep-98	02-Oct-98 (A)
	LAr L2/3	Start Electronics Production (Preamps)	30-Jun-00	30-Jun-00 (A)
	LAr L2/4	FCAL Mechanical Design Complete	14-Dec-98	15-Dec-99 (A)
	LAr L2/6	Level 1 Trigger Final Design Complete	04-Oct-01	30-Mar-02 (F)
	LAr L2/7	ROD Final Design Complete	12-Dec-02	12-Dec-02 (F)
	LAr L2/8	Motherboard System Production Complete	30-Jun-02	30-Jun-02 (F)
	LAr L2/9	Cryostat Arrives at CERN	15-May-01	02-Jul-01 (A)
	LAr L2/10	Barrel Feedthroughs Production Complete	15-Feb-02	1-Jun-02 (F)
	LAr L2/11	FCAL-C Delivered to EC	17-Oct-02	17-Oct-02 (F)
	LAr L2/12	FCAL-A Delivered to EC	08-Dec-03	08-Dec-03 (F)

U.S. ATLAS Major Project Milestones (Level 2) (Continued)

Subsystem	Schedule Designator	Description	Baseline Schedule	Forecast (F) / Actual (A) Date
Tile Cal (1.4)	Tile L2/1	Start Submodule Procurement	01-Sep-97	01-Sep-97 (A)
	Tile L2/2	Technology Choice for F/E Electronics	15-Nov-97	15-Nov-97 (A)
	Tile L2/3	Start Module Construction	01-May-99	20-Sep-99 (A)
	Tile L2/4	Start Production of Motherboards	01-Apr-01	30-Mar-01 (A)
	Tile L2/5	All Electronic Components Delivered to CERN	01-Oct-02	01-Oct-02 (F)
	Tile L2/6	Module Construction Complete	30-Sept-02	30-Sep-02 (F)
	Tile L2/7	All Modules Delivered to CERN	02-Dec-02	02-Dec-02 (F)
Muon (1.5)	Muon L2/1	Start MDT Chambers Lines 1 and 3	17-Jul-00	15-Sep-00 (A)
	Muon L2/2	Start CSC Chamber Production	01-Sep-01	01-Oct-01 (A)
	Muon L2/3	MDT Electronics ASD PRR	19-Oct-01	31-Jan-02 (F)
	Muon L2/4	Final Design of Global Alignment Devices Complete	01-Apr-02	01-Apr-02 (F)
	Muon L2/5	CSC IC Production Complete	15-May-02	15-May-02 (F)
	Muon L2/6	Kinematic Mount Design Complete	30-Jan-01	30-Jan-01 (A)
	Muon L2/7	MDT Chambers (U.S.) Production Complete	27-Aug-04	14-Sep-04 (F)
	Muon L2/8	Kinematic Mount Production Complete	24-May-04	24-May-04 (F)
	Muon L2/9	CSC ROD Production Complete	05-Nov-03	05-Nov-03 (F)
	Muon L2/10	MDT Elec.'s Mezzanine Production Complete	06-Mar-03	06-Mar-03 (F)
	Muon L2/11	CSC Assembly/Testing at CERN Complete	17-Dec-04	17-Dec-04 (F)
	Muon L2/12	Global Alignment System Final Delivery	30-Sep-04	30-Sep-04 (F)
Trigger/ DAQ (1.6)	TDAQ L2/1	Select Final LVL2 Architecture	31-Dec-99	31-Mar-00 (A)
	TDAQ L2/2	LVL2 Trigger Design Complete	31-Dec-02	31-Dec-02 (F)
	TDAQ L2/3	LVL2 Trigger Prototype Complete	30-Sep-02	30-Sep-02 (F)
	TDAQ L2/4	Start Production	08-Jan-03	08-Jan-03 (F)
	TDAQ L2/5	Start Installation & Commissioning	05-Mar-03	05-Mar-03 (F)
	TDAQ L2/6	Production Complete	30-Jul-05	30-Jul-05 (F)
	TDAQ L2/7	LVL2 Installation & Commissioning Complete	30-Sep-05	30-Sep-05 (F)

U.S. ATLAS Major Project Milestones (Level 4)

WBS	Schedule Designator	U.S. ATLAS Responsibility Completion Description	ETC01 Baseline Scope Planned Completion Date	Forecast (F)/ Actual (A) Baseline Scope Completion Date	ATLAS Required Date	Baseline Scope Planned Float (Months)
Silicon						
1.1.2	Sil L4/1	Complete Shipping of Silicon Strip Prod Modules	10/03	10/03	4/03	-6
1.1.3	Sil L4/2	RODs 45% Production Complete	9/02	9/02	6/03	9
1.1.1	Sil L4/3	Pixels 'Disk System at CERN'	10/04	10/04	12/04	2
TRT						
1.2.1	TRT L4/1	Barrel Modules Ship to CERN Complete	8/02	8/02	3/03	7
1.2.5	TRT L4/2	ASDBLRs Ship to LUND Complete	10/02	10/02	11/02	1
	TRT L4/3	ASDBLRs Ship to CERN Complete	11/02	11/02	12/02	1
	TRT L4/4	PCB-Endcaps Ship to CERN Complete	4/03	4/03	10/03	6
LAr						
1.3.1	LAr L4/1	Cryostat Final Acceptance Test Complete	8/01	8/01 (A)	11/01	3
1.3.2	LAr L4/2	Signal FT Installation Complete	11/02	11/02	10/02	-1
	LAr L4/3	HV FT End-Cap C Install Complete	2/02	2/02	11/01	-3
	LAr L4/4	HV FT Barrel Install Complete	11/01	**5/02**	5/02	**0**
	LAr L4/5	HV FT End-Cap A Install Complete	12/02	12/02	9/02	-3
1.3.3	LAr L4/6	LAr Cryogenics Vendor Install Complete	9/03	9/03	12/03	3
1.3.4.1	LAr L4/7	Last Del of Readout Electrodes	12/02	12/02	10/02	-2
1.3.4.2	LAr L4/8	MBs Ship to Annecy,Saclay (France)	6/02	6/02	9/02	3
1.3.5.1	LAr L4/9	Preamp Deliveries to FEB Complete	5/03	5/03	¾	10
1.3.5.2	LAr L4/10	Prec Calor Calib Production Complete	N/A	N/A	N/A	N/A

U.S. ATLAS Major Project Milestones (Level 4) (Continued)

WBS	Schedule Designator	U.S. ATLAS Responsibility Completion Description	ETC01 Baseline Scope Planned Completion Date	Forecast (F)/ Actual (A) Baseline Scope Completion Date	ATLAS Required Date	Baseline Scope Planned Float (Months)
Lar (Continued)						
1.3.6.1	LAr L4/12	Pedestal Ship to CERN Complete	12/01	12/01	7/02	7
	LAr L4/13	Barrel Ship to CERN Complete	12/01	12/01	3/03	15
1.3.6.2	LAr L4/14	Cables Shipping Complete	10/02	10/02	3/03	5
	LAr L4/15	Baseplane Last Delivery to CERN Complete	10/02	10/02	3/03	5
1.3.6.3	LAr L4/16	EC Crates Last Delivery to CERN Complete	10/02	10/02	3/03	5
	LAr L4/17	Barrel Crates Last Delivery to CERN Complete	10/02	10/02	3/03	5
1.3.6.4	LAr L4/18	Controls Ship to CERN Complete	9/03	9/03	5/04	8
	LAr L4/19	Power Supplies Last Delivery Complete	9/04	9/04	5/04	-4
1.3.6.5	LAr L4/21	Thermal Contacts (Proto) Last Delivery Complete	9/02	9/02	9/02	0
1.3.7.1	LAr L4/22	FEB Last Delivery Complete	8/04	8/04	1/05	5
1.3.7.4	LAr L4/24	Last Driver Delivery to FEB Complete	4/04	4/04	5/04	1
1.3.8.1	LAr L4/26	Layer Sums Last Delivery to FEB Complete	12/02	12/02	3/04	15
1.3.8.2	LAr L4/27	I/F to Level 1 Ship to CERN Complete	8/04	8/04	12/04	4
1.3.9	LAr L4/28	ROD System Final Prototype Complete	8/02	8/02	8/02	0
1.3.10	LAr L4/29	Deliver Finished FCAL-C to EC	10/02	10/02	10/02	0
	LAr L4/30	Deliver Finished FCAL-A to EC	12/03	12/03	11/03	-1
	LAr L4/31	FCAL Elec.'s Summ Bds Ready for Installation	12/01	12/01	2/02	2
	LAr L4/32	FCAL Elec.'s Cold Cables Testing Complete	11/01	11/01	2/02	3

U.S. ATLAS Major Project Milestones (Level 4) (Continued)

WBS	Schedule Designator	U.S. ATLAS Responsibility Completion Description	ETC01 Baseline Scope Planned Completion Date	Forecast (F)/ Actual (A) Baseline Scope Completion Date	ATLAS Required Date	Baseline Scope Planned Float (Months)
Tile						
1.4.1	Tile L4/1	Submodules Construction Compl (Original Baseline Scope –Qty. 45)	7/01	3/01 (A)	8/01	5
	Tile L4/2	EB Module Ship to CERN Complete (Qty. 40)	12/01	12/01	7/02	7
1.4.2	Tile L4/3	Optics Instrumentation at ANL & MSU Complete	9/02	9/02	11/02	2
1.4.3	Tile L4/4	PMT Ship to ATLAS Complete	1/02	½	7/02	6
1.4.3	Tile L4/5	Readout Ship to ATLAS Complete	11/02	11/02	3/03	4
1.4.4	Tile L4/6	Gap Submodules Ship to ANL & BCN Compl (Original Baseline Scope-Qty. 77)	7/01	4/01 (A)	8/01	4
1.4.1	Tile L4/7	Submodule Construction Compl (Qty. 576)	3/02	3/02	7/02	4
1.4.1	Tile L4/8	EB Module Ship to CERN Complete (Qty. 64)	12/02	12/02	1/03	1
1.4.4	Tile L4/9	Gap Submodules Ship to ANL & BCN Compl (Qty. 128)	7/02	7/02	7/02	0
Muon						
1.5.7 (1)	Muon L4/1	MDT Chamber Prod Complete (BMC Qty. 80)	6/04	6/04	2/04	-4
		MDT Chamber Prod Complete (Mich Qty. 80)	8/04	8/04	2/04	-6
		MDT Chamber Prod Complete (Seattle Qty. 80)	8/04	8/04	2/04	-6
1.5.8 (2)	Muon L4/2	MDT Mounts Prod Complete/Delivered to Chambers	10/03	10/03	2/04	4
1.5.9 (3)	Muon L4/3	MDT Elec.'s Mezzanine Bd Production Complete	3/03	3/03	2/03	-1
	Muon L4/4	MDT Elec.'s Hedgehog Production Complete	12/01	12/01	4/01	-8
1.5.4	Muon L4/5	CSC Chambers Production Complete	1/03	1/03	4/04	15
1.5.11 (5)	Muon L4/6	ASMs Production Complete	4/04	4/04	4/04	0
	Muon L4/7	Sparsifiers Ship to CERN	3/04	¾	10/04	7

	Muon L4/8	RODs Ship to CERN	3/04	¾	10/04	7
	Muon L4/9	Support Electronics Ship to CERN	3/04	¾	10/04	7
1.5.12 (6)	Muon L4/10	Align Bars Ship to CERN	3/04	¾	12/04	9
	Muon L4/11	Proximity Monitors Ship to CERN	12/03	12/03	12/04	12
	Muon L4/12	Multi-Point System Ship to CERN	3/03	3/03	3/05	24
	Muon L4/13	DAQ Ship to CERN	9/04	9/04	12/04	3
Trig/DAQ						

13. NSF COST SCHEDULE STATUS REPORT

Fourteen US ATLAS institutions will receive funding under the NSF Cooperative Agreement (No. PHY 9722537) in FY01. Technical progress reports are given in the respective subsystem paragraphs of Section 4. The NSF Cost Schedule Status Report (CSSR) in this section covers these 14 institutions, in addition to the Education, Institutional Dues and Common Project items which will be funded by the NSF, and also the Items Outside Approved Baseline and Contingency.

Status through the month of November 2001 reflects the ETC 01 baseline schedules for all subsystems. The schedules are resource-loaded to the baseline funding of $163,750K with Contingency, Management Contingency and Items Outside of the Approved Baseline shown on separate lines, excluding all NSF R&D funds. The anticipated NSF contribution to the baseline funding is $60,800K

We note that more than half of the universities in the NSF CSSR are, or have been, funded by both NSF and DOE, while we manage the project without distinguishing the agency source of funding. For this reason, the NSF+DOE Budgeted AY$s column in Table 13-1 includes all Project funds allocated to each institution, while the last two columns to the far right show the contribution of each agency.

Status through the month of November 2001 reflects the baseline schedules established on October 1, 2000. Effort is currently ongoing to re-baseline the schedules based on a new bottom up estimate. In order to focus on the re-baseline effort this month's status has been treated as level of effort where BCWS and BCWP were incremented by the increase in ACWP.

The CSSR shows that $29,466.2K of the work has been completed which represents approximately 51.7% of the work authorized to date. There is an unfavorable schedule variance of $581.0 or 1.9% behind the plan and a favorable cost variance of $322.6K or 1.1% under spent for the work accomplished. There are outstanding commitments of $1,439.3k at this time that do not show up in the performance.

Schedule Variance

Hampton – SV = ($273.6k)

WBS 1.2.1.1.3 Barrel Module Component Assembly is behind plan $273.6k

Cost Variance

Although the overall cost variance for NSF Institutions is a favorable $767.2k it is comprised of both positive and negative variances as follows:

- Brandeis – CV = ($290.5k)
  - Over spent on tooling ($58.0k)
  - Charging against Global System Production tasks ($144.0k)
- Harvard – CV = ($87.8k)
- Nevis – CV = ($156.5K)
  - Over spent on the FEB ($198.7k)
  - Offset by small positive CV in the ROD System and Beam Tests
- MSU CV = $41.3K
- UCI CV = $44.4k

- UCSC CV = $256.6k
  - The Silicon Strip System is under spent in the area of Design, Development and Prototypes
- University of Rochester CV = $163.3K
  - Under spent by $151.6k on Vendor Manufacturing but shows an outstanding commitment of $178.4k
- University of Texas at Arlington CV = $432.2K
  - Under spent on Intermediate Tile Calorimeter Production
- University of Chicago CV = $103.0K
  - Under spent on Readout and Front End Motherboards by $33.6k and $77.8k respectively
  - Over spent by ($26.5k) Extended Barrel Module
- University of Washington CV = ($244.7k)

Table 13

Cost Schedule Status Report

Reporting Period Ending:11/30/01

	Cumulative To Date (k$)					At Completion (k$)			Complete (%)				
	Budgeted Cost		Actual Cost	Variance		NSF + DOE	Latest					Budgeted AY $s	
	Work	Work	Of Work			Budgeted	Revised					NSF	DOE
Institution	Scheduled	Performed	Performed	Schedule	Cost	AY $s	Estimate	Variance	Scheduled	Performed	Actual		
Brandeis	2,005.5	1,998.2	2,288.7	(7.3)	(290.5)	2,848.5	2,848.5	-	70.4	70.1	80.3	2,413.3	435.2
Harvard	3,399.4	3,390.7	3,478.5	(8.7)	(87.8)	6,909.4	6,909.4	-	49.2	49.1	50.3	6,909.4	
Columbia Nevis Lab [2]	4,381.7	4,374.1	4,530.6	(7.6)	(156.5)	9,458.1	9,458.1	-	46.3	46.2	47.9	9,196.8	261.3
Hampton University	1,382.4	1,108.8	1,114.5	(273.6)	(5.7)	1,495.3	1,495.3	-	92.4	74.2	74.5	1,495.3	
Michigan State University	721.6	680.3	639.0	(41.3)	41.3	1,075.5	1,075.5	-	67.1	63.3	59.4	1,040.2	35.3
Oklahoma	183.2	182.7	154.3	(0.5)	28.4	393.7	393.7	-	46.5	46.4	39.2	342.3	51.4
Pittsburg	687.4	645.8	607.0	(41.6)	38.8	2,033.6	2,033.6	-	33.8	31.8	29.8	1,920.1	113.5
SUNY Stony Brook	1,489.4	1,469.7	1,469.9	(19.7)	(0.2)	1,089.1	1,089.1	-	136.8	134.9	135.0	1,083.9	5.2
University of California Irvine	776.3	696.9	652.5	(79.4)	44.4	2,010.4	2,010.4	-	38.6	34.7	32.5	1,715.8	294.6
University of California Santa Cruz	3,668.4	3,663.9	3,407.3	(4.5)	256.6	3,984.5	3,984.5	-	92.1	92.0	85.5	3,286.3	698.2
University of Rochester	5,905.5	5,905.5	5,742.2	-	163.3	9,287.6	9,287.6	-	63.6	63.6	61.8	8,936.7	350.9
University of Texas Arlington	1,550.4	1,532.1	1,099.9	(18.3)	432.2	1,534.7	1,534.7	-	101.0	99.8	71.7	1,431.0	103.7
University of Chicago	2,117.0	2,110.4	2,007.4	(6.6)	103.0	2,126.9	2,126.9	-	99.5	99.2	94.4	2,115.4	11.5
Washington	1,779.0	1,707.1	1,951.8	(71.9)	(244.7)	3,241.0	3,241.0	-	54.9	52.7	60.2	3,241.0	
Education [3]				-	-	286.5	286.5	-	-	-	-	286.5	
Institutional Dues [3]				-	-	2,036.6	2,036.6	-	-	-	-	1,930.4	106.2
Common Projects [3]				-	-	7,142.5	7,142.5	-	-	-	-	652.2	6,490.3
Sub Total	30,047.2	29,466.2	29,143.6	(581.0)	322.6	56,953.9	56,953.9	-	52.8	51.7	51.2	47,996.6	
								-				-	
Items outside baseline						2,388.5	2,388.5	-				2,388.5	
Management Contingency						4,921.7	4,921.7	-				4,921.7	
Contingency						4,219.9	4,219.9	-				4,219.9	
Project Management						1,273.3	1,273.3	-				1,273.3	
							-						
Total (with DOE Funds included)	30,047.2	29,466.2	29,143.6	(581.0)	322.6	69,757.3	69,757.3	-	43.1	42.2	41.8		8,957.3
Total NSF Funds												60,800.0	
Note 1. Not used												60,800.0	69,757.30
2. Nevis Costs do not currently include Project management costs												-	
3. Treated as LOE based on actuals reported													

14. DETAILED TECHNICAL PROGRESS

1.1 SILICON

Milestones with changed forecast dates:

1.1.1.1.1 Design

Milestone	Baseline	Previous	Forecast	Status
Release bids for initial cables	16-Apr-02	16-Apr-02	15-Dec-02	Delayed (See #1)

Note #1 Final definition of services has been delayed.

1.1.1.2.1 Design

Milestone	Baseline	Previous	Forecast	Status
Compl. Spec for production order release	12-Mar-01	1-Nov-01	10-Dec-01	See Note #1

Note #1 Production is planned to begin in January 2002. Since there is considerable slack in the sensor schedule, this has no impact on the global schedule.

1.1.1.4.1 Design

Milestone	Baseline	Previous	Forecast	Status
Optical FDR	31-Jan-02	15-Feb-02	10-Oct-02	Delayed (See #1)
Release Flex Bids	24-Apr-02	24-Apr-02	1-Nov-02	Delayed (See #2)

Note #1 Have shifted this milestone to allow for testing IBM optical ICs and prototype optical boards during most of summer test beam period.
Note #2 This is delayed because of overall project delays. The forecast date depends on success of the FE-I electronics and only minor changes required in the production flex design from v4.

1.1.1.4.3 Production

Milestone	Baseline	Previous	Forecast	Status
Start initial production buy of components	13-Dec-01	13-Dec-01	1-Nov-02	Delayed (See #1)

Note #1 Delayed until after PRR. There is no longer a critical shortage of components.

1.1.1 Pixels **Murdock Gilchriese (Lawrence Berkeley Lab.)**

1.1.1.1 Mechanics

Production of the disk sectors is proceeding well. All faceplates have been cut successfully and about one-half measured in detail. Fabrication of other components and final tooling tweaks are underway. Fabrication of the pre-production support ring components has started. There are a few design interfaces to resolve for the global support frame, but the creation of detailed drawings has started. The next major hurdle is to structure the procurement packages or packages. Materials for making foot-long prototypes of the pixel support tube sections (PST) both in carbon fiber and fiberglass have been ordered. Quotes for manufacturing the mandrels were solicited, including from Ohio State. Creating a combined SCT-PST FEA model is moving slowing. The SCT model developed in Europe requires considerable work to convert to ANSYS at LBNL. A concept for the very crowded PP1 region was created for a Services Conceptual Design review in early December. The conceptual design of the beam pipe support is proceeding and a preliminary cost estimate of about 400K was made by the engineer in charge of the design. This includes all labor.

1.1.1.2 Sensors

Tesla has been approved technically to begin production based on measurements of preproduction wafers. It is desired to place a production order (starting with about 25% production) by December. A BCP to fund the US share of this order was submitted. Costs are slightly under the estimate of a year ago.

1.1.1.3 Electronics

The reticle and wafer layout for the first wafer-scale 0.25-micron submission to IBM was completed. Wafers should be delivered to CERN by about mid-January. This is about an 11-week delay relative to the baseline schedule.

1.1.1.4 Hybrids

Flex 3.x hybrids were delivered from Compunetics and component loading started. The design of flex 4.x is proceeding but needs to be accelerated so that submission to at least one vendor can occur before the end of the year.

1.1.1.5 Modules

First thinning trials of 8"(not bumped) wafers have been successful. IZM has successfully bumped 8" dummy wafers and it's possible the first dummy modules (with unthinned chips) will be available before the end of the year. AMS has not yet bumped 8" wafers but expects to in December.

1.1.1.1 Mechanics

1.1.1.1.1 Design

Milestone	**Baseline**	**Previous**	**Forecast**	**Status**
Cables/services CDR	20-Jun-01	--	10-Dec-01	Delayed (See #1)
Release bid for Support tube	4-Dec-01	--	5-Oct-02	Delayed (See #2)
Support tube FDR	10-Dec-01	--	15-Jun-02	Delayed (See #3)
Release bids for support	18-Dec-01	--	5-Oct-02	Delayed (See #4)
Bid evaluation complete for support	12-Feb-02	--	15-Dec-02	Delayed (See #5)
Support tube bid eval complete	12-Feb-02	--	15-Dec-02	Delayed (See #6)
Assembly/Installation CDR	26-Feb-02	--	15-Jun-02	Delayed (See #7)
B-layer CDR	26-Feb-02	--	26-Feb-02	On Schedule (See #8)
Cables/services FDR	26-Feb-02	--	15-Jun-02	Delayed (See #9)

Global Support PRR	26-Feb-02	--	26-Feb-02	On Schedule
Support tube PRR	26-Feb-02	--	1-Oct-02	Delayed (See #10)

ATLAS PM approval of global support procurement	5-Mar-02	--	5-Mar-02	On Schedule
ATLAS PM approval of Support tube procurement	5-Mar-02	--	15-Dec-02	Delayed (See #11)
Release bids for initial cables	16-Apr-02	16-Apr-02	15-Dec-02	Delayed (See #12)

Note #1 Gap decision requires some redesign. Uncertainties about voltage regulators.

Note #2-7, 10-11 Design scope increased to support beam pipe, many interfaces to be resolved with other systems.

Note #8 No longer relevant. Different design concept.

Note #9 Gap decision requires some redesign. Uncertainties about voltage regulators.

Note #12 Final definition of services has been delayed.

Neal Hartman (Lawrence Berkeley Lab.)

PIXEL SUPPORT TUBE ANALYSIS

In keeping with the goal of integrating the PST and SCT models into one vibrational FEA model, an ANSYS import for the SCT was obtained. Material properties and other properties transferred well, however, some constraint equations from the native program (IDEAS) did not transfer well to ANSYS. An IGES model has been requested from EPFL, and will be imported as soon as possible. This model will have to be meshed and assigned properties, which will take more time than was previously expected, but should still be successful. After demonstrating that the imported SCT model is accurate (using gravity sag as a comparison) the PST model will be incorporated and analyzed.

Sally Seidel (University Of New Mexico)

The layout of PP1 continued evolving. M. Hoeferkamp completed several iterations. Changes include replacement of electrical panel connectors by slots through which the electrical signals will feed via flex cables. As this change did not free enough space for all the fittings, the optical connectors were changed from 7.5mm x 25mm panel mount connectors to connectors with a 5mm x 10mm outline. The final design is for a three-layer system.

Murdock Gilchriese (Lawrence Berkeley Lab.)

Global Support Frame

Some effort was completed to finalize all details of the global support frame and begin the production of detailed drawings and a bid package. The few issues that remain involve interfaces to the barrel shells being built in Europe, temporary fixation features for handling during assembly and the connection to the pixel supports being designed at LBNL. We remain on track for a PRR in February 2002.

PP1 Region

A complete conceptual design of the PP1 region was created in preparation for a Services Conceptual Design Review in early December. Although considerable detailed work remains, this is a major step forward to visualizing a possible solution to this very complex area. The conceptual design will be expanded by February to include the interface to the services running to PP2 and to the service panels. A prototype will have to be built to verify the design.

1.1.1.1.2 Development/Prototypes

Milestone	**Baseline**	**Previous**	**Forecast**	**Status**
Support tube development complete	10-Dec-01	--	15-Jun-02	Delayed (See #1)

Note #1 Design scope increased to support beam pipe, many interfaces to be resolved with other systems. Critical interface to SCT likely to change significantly.

Neal Hartman (Lawrence Berkeley Lab.)

PIXEL SUPPORT TUBE (PST)

Fiber and part area calculations have been performed for all prototype parts that need to be fabricated for the PST. Material has been chosen and ordered, including unidirectional prepreg tapes (carbon and quartz), prepreg cloth (carbon), prepreg fiber mat (quartz), and dry fiber mat (quartz). All resin systems are cyanate ester, and all prepregs were ordered with a nominal 3% excess of resin (by volume). Delivery is expected in early January. Requests for quotes for the prototype PST mandrel have also been issued. Two mandrels will be fabricated, one steel and one aluminum, in order to account for the fact that the forward PST will be made from quartz (aluminum mandrel), while the barrel PST will be carbon (steel mandrel). Quotes for these fabrications are expected in early December, and orders will be issued soon thereafter.

The friction tester for evaluating PST slider materials has also been constructed and initially tested. Both virgin PEEK and VESPEL have been tested on aluminum and glass (G10) substrates. Results have been consistent to the 5% level, suggesting that the friction tester will be a valuable tool for use with carbon test panels, once they are fabricated.

Additionally, it has been decided to fabricate these test panels in house, rather than at the fiber vendor, as the cost will be substantially lower, and will offer the added benefit of gaining experience for technicians and others at the lab.

COOLING SERVICES

Luer lock fittings (Al/Al) that were previously mated and demated were sent for irradiation in C_3F_8 to 50 MRad. These fittings were immersed in the liquid for a period of more than 1 week. Upon removal, they were vacuum checked, at which point 1 of 3 samples obviously leaked from the glue joint. The two remaining samples were tested for leaks at 0 and -35 Celsius, and both passed the specification. The three fittings were disassembled, coming apart easily with torques of 0.25 to 0.6 Nm. For reference, the indium stave fitting designed at CERN requires 1 Nm for closure. The mating surfaces of the demated luer locks were shiny, with a layer of vacuum grease (applied during mate-up) still evident. This test allays any fears that the luer lock fittings (being both aluminum) might gall after exposure to C_3F_8 in a high radiation environment.

Because of the high mass of current luer lock fittings, an effort has been initiated to design a lower mass fitting that is no more than twice the mass of an indium variant. In addition to this effort, we are also designing an indium fitting (made from aluminum) specifically for the sector. These designs were largely completed by the end of November, with most mass goals being met. Final fitting designs will be ordered for a "pre-production" run in early December.

Possible capillary, type 0, and type 1 tubing has been received. The capillary is 0.95 mm ID, with a 1/16" OD. We plan to test this tubing for bendability and robustness, with swage lock fittings (standard size). The type 0 tubes are approximately 4 mm ID, and the type 1 tubes are 8 m ID, in accordance with cooling specifications. Since the material comes from the same vendor as the "confused" 1060/3003 tubing, the 4 and 8 mm tubes were compositionally tested. Interestingly, the 4 mm tube turned out to be 3003, while the 8 mm tube was again 1060. These results indicate that either a new vendor needs to be found for the tubing, or we need to demonstrate conclusively that we can weld to 3003 tubes (this is the preferred course of action). The capillary tubing has not been tested, but will be in the near future. In addition to this capillary tubing, smaller sized tubing may also need to be found.

A bent sector tube was successfully welded by the laser weld vendor. During a visit to he vendor, handling and other concerns were discussed, and it was decided to send each sector tube with a self fixturing protective plate that would not only align the fittings in the proper position, but would also prevent bending of or other damage to the sector tubes. In early 2002, the vendor will fabricate a complete tubing run (with low mass luer lock fittings and indium ones) for the sector between the pixel detector and PP1.

1.1.1.1.3 Production **Murdock Gilchriese (Lawrence Berkeley Lab.)**

Disk Sectors

The preparation of parts and final tooling for assembly of the disk sectors is progressing well. All faceplates (140) have been cut and visual quality is excellent. About one-half have been inspected using automated scanning to compare the profile and other dimensions to the as-drawn dimensions. Grinding of foam pieces has started. Modifications are in the shop for the tube bending fixture after initial experience. Orders for other small components have been placed for delivery in January. Some tooling was mismachined and will be plugged and redrilled. We are on course to begin first assemblies in January.

Disk Support Rings

This is also proceeding well. The materials and tooling for the trial C-channels have been ordered or are on the way. We expect first C-channels for inspection in January.

1.1.1.2 Sensors

1.1.1.2.1 Design

Milestone	Baseline	Previous	Forecast	Status
Compl. Spec for production order release	12-Mar-01	1-Nov-01	10-Dec-01	See Note #1
ATLAS PM approval of production procurement	23-Jul-01	--	10-Dec-01	See Note #2
Release initial MC for sensors/testing	23-Jul-01	--	1-Dec-01	Delayed (See #3)

Note #1-3 Production is planned to begin in January 2002. Since there is considerable slack in the sensor schedule, this has no impact on the global schedule.

1.1.1.2.2 Development/Prototypes **Sally Seidel (University Of New Mexico)**

The final batch of TESLA pre-production sensors was completed and tested by the probing institutes. Oxide capacitance, flatband voltage, depletion voltage, breakdown voltage, operating voltage and current, and current slope were measured. No significant non-conformities were observed.

A request was received from TESLA regarding a modification of alignment marks. The modification involves removal of the marks from mini-chips and is being addressed.

1.1.1.2.3 Production

Milestone	Baseline	Previous	Forecast	Status
First Outer production wafers delivered	18-Jan-02	--	18-Jan-02	On Schedule

Sally Seidel (University Of New Mexico)

TESLA was invited to offer a 35% 3-good-tile option in the case that this will provide a lower price for production wafers. A contract for the 50% option was written in the case that the 35% option is not accepted. The final contract for 1000 production sensor tiles was submitted to CiS.

1.1.1.3 Electronics

1.1.1.3.1 Design

Milestone	Baseline	Previous	Forecast	Status
FE-I1 spec complete	16-May-01	--	1-Dec-01	Delayed (See #1)
FE-I2 spec complete	10-Apr-02	--	10-Apr-02	On Schedule

Note #1 Significant work on the specification was completed during November, with all registers and data formats now complete. A first draft of a testing plan was also written. We hope to finish this specification by mid-January when the wafers return.

Kevin Einsweiler (Lawrence Berkeley Lab.)

This month was spent wrapping up the IBM FE-I run, and beginning intensive preparations for the return of the wafers.

We had verification problems with the full FE-I chip right up to the end. We had completed a hierarchical LVS of the chip during October, using the new Assura toolset from Cadence. However, we have no experience with this toolset, and we were concerned that since the design was never prepared for a hierarchical LVS, that the verification might have been incomplete. With the version of Diva which we had installed, we were unable to verify the complete chip. Based on a suggestion from Cadence, we installed the latest version of Cadence, and set up to use a new 64-bit version of Diva which was claimed to be capable of LVS verification of very large chips like ours. This tool took about 2 days to run each time, making debugging difficult. It did not converge to an error-free verification, but it was not reporting errors in the normal way either. We then kept removing more pixels from the full chip until we had reduced to a design that had the full hierarchy, but that could also be LVSed using the old 32-bit Diva. This chip had the full 64 EOC buffers, but only 2 groups of 16 pixels per column instead of the full 10 groups, and only 700K transistors instead of the full 2.5M in the complete chip. Finally, in this case, we could get a good LVS with the older 32-bit Diva but not with the newer 64-bit Diva. We do not yet understand this discrepancy, but at this point we decided to give up and send in the complete design file. In parallel, we had already submitted the list of DRC errors for the design, along with justifications for why IBM should manufacture the chip anyway. All of the errors involved complex issues in the pads (bump-bond, probe, and wire-bond). After review by IBM, we were requested to fix one error involving passivation openings in a capacitor test structure. The final GDS file for the reticle was accepted by IBM on Nov 20. Several days later, we received an updated GDS file back from IBM, in which they had applied their layer-filling algorithm to force the reticle to satisfy their density rules. In this run, we had worked hard to satisfy these rules for the fraction of each critical layer (active, poly, and all metal layers) that must be filled for all of the analog blocks, and for the complete pixel chip. We checked the filled GDS and agreed that it was fine.

On Nov 27, CERN received a first copy of the wafer map for approval, and realized that IBM had not followed our directions about placement of IBM test structures in the dicing streets between reticles. This error would have made it very difficult to dice the wafer and achieve the tight size constraints that we place on the pixel die (otherwise, they cannot be placed with the proper separation on the sensor substrate for module flip-chipping). We requested that IBM fix this error. This was done, causing some days of additional delay. Finally, on Dec 7 we received the final wafer map. There are 112 good reticles on the wafer. With this additional information, we will proceed to lay out the bump-bonding masks required by the bumping vendors in order to deposit bumps in the correct locations on the wafers.

We do not yet have an official estimated wafers-out date from IBM. Informal comments suggest that it should be possible to get the wafers by the end of January. We have placed orders for two back-to-back engineering runs, in order to obtain 12 wafers in total. These wafers will apparently be processed in a single run, and we expect to receive them all at the same time.

With the submission out, we are now working to archive all of the relevant design files, so that it will be possible to recreate exactly what was submitted. These files will all be placed in a limited number of directories, and we will then make a set of CD-R disks for distribution to the designers in the collaboration. In this way, any time there is a question about exactly what is included in the submission, we have a reliable reference.

The work assignments for the engineers for the next few months have also been agreed upon. The engineer who did most of the work on the digital readout will continue his large simulations with the TimeMill and PowerMill toolset in order to provide us with clear benchmarks for the expected timing and power consumption of the chip. We have never used these tools for a complete chip, and they were critical to performing large-scale (300K transistor) simulations of the design. We will want to normalize their predictions to the actual behavior of the pixel chip, in order to calibrate the toolset for use in future iterations of the design. In particular, as simulating and optimizing digital power consumption is very complex, we hope to use these tools to reduce the overall power consumption of the final chips. Our estimates for the current FE-I suggest that the digital consumption will be closer to our worst-case assumption (40mA per chip) than towards our nominal value (25mA).

Finally, the major activity over the next few months in IC design will be working on an improved front-end design for the FE-I2 submission. This submission is targeted for Sept 02, and is another critical milestone. In order to implement front-end improvements, it is critical for us to submit a new test chip, like the ones we fabricated with TSMC and IBM in Feb/Mar 2001. Our target date for this test chip submission is March 2002. There is a MOSIS TSMC run on March 11, and a planned IBM MPW run at CERN in mid-March. This front-end improvement effort is expected to fully occupy our analog designer over the coming 9-10 months before the next engineering run.

As the pinout of the FE-I is now frozen, schematic and layout work on the necessary probe cards and support cards required for testing wafers, single die, and modules is advancing nicely. All of these cards need to be updated, because of major changes to the pinout required to meet the production module mechanical envelopes. These cards will all be modified and re-fabricated over the next 4 weeks, in order to have everything ready in time for the returning wafers. The cards are all quite simple, requiring about 2-3 days of layout work each. We also have to update the schematic and layout of our support card for the Analog Test Chip in this run (similar, but not identical, to the prototype chips we fabricated in Feb/Mar this year with IBM and TSMC). This may require about one week of work. Finally, one of the small chips included on our IBM engineering run is a small LVDS Buffer chip, similar to one we built with DMILL in the past. This chip allows us to implement all of the active circuitry required for our support cards in a small rad-hard die, making irradiation of pixel chips and modules fairly straightforward. We have designed our new IBM LVDS buffer chip to fit a standard SOIC28 package. This part will be used to provide rad-hard LVDS buffering and LVDS to CMOS conversion at our nominal operating voltage of 2.0V on all of our standard support cards. A probe card will be designed for this chip, and a rapid test procedure will be used to make sure we get packaged parts quickly for use on support cards.

In order to exercise the new generation of chips from IBM to the fullest extent possible, and in particular to develop the capability to label chips as “known good die”, and be sure that this classification will remain true after exposure to the full radiation doses of ATLAS, we are completing our improved test system.

We have continued testing of the first TPLL boards received. This work is now essentially complete. We have succeeded in performing all of the standard scan operations on existing single chips and modules with the TPLL. The next step is to implement the additional minor upgrades to the VHDL that are required for the FE-I chips. Finally, there are several small modifications to the schematic and layout which we have uncovered over the last several months of debugging. We expect to revise the TPLL schematics and board layout during the month of Dec, and submit the revised board for fabrication of the production quantity of TPLL (20 boards total). The major needs for testing in the collaboration will occur starting after March 02, when bump-bonded modules based on the new FE-I start to appear in pixel institutions. It should be possible for us to deliver a significant number of the revised production TPLL boards by that time.

The PICT board layout is finally almost complete, but suffered many delays during November. More than one week was lost due to a combination of hardware and software problems with Mentor. Also, conflicts continued with the ROD work, as during this period the pre-production ROD boards were fabricated and sent out for loading. This work is all handled by the same engineer who is working on the PICT layout. We now anticipate being able to send the PICT board out for fabrication by about Dec 17, and have boards back in the first week in January. The board will be 12 layers, but does not use any particularly aggressive design rules, so fabrication should be straightforward. The VHDL programming for the board is now almost complete. The new TPLL-PICT slow-control protocol has been developed, along with all of the special commands to control the many chips on the PICT from the TPLL. The host PC programming is also fairly well-advanced, based on the command specification. We hope to have the first board working in our lab by the middle of January, but this schedule is very late for the wafer return date.

For this reason, we have put into place a back-up plan. This plan will give us the ability to carry out reasonably complete digital testing, and simple analog testing, of the FE-I chips in the absence of the PICT. Our collaborators in Bonn also have a back-up plan based on a simpler board that will allow them to make fairly complete analog measurements of the chips also. This situation is not very satisfactory, as we really want to accumulate a consistent set of high-quality data on all of the chips that return from this run, and this can only be done at the wafer probe level. However, the backup will allow us to proceed to fabricate modules in a reliable way for testing, and this is the most critical requirement.

K.K. Gan (Ohio State)

VDC-I3 and DORIC-I3 have been submitted to IBM for fabrication in a MPW run. The VDC has been redesigned to consume ~30% less current and have less ripple in the current consumption. The DORIC has the first implementation of a single-ended pre-amp. A dummy pre-amp channel is added to cancel all noise except the white noise that adds in quadrature. The overall noise is predicted to be slightly less than that in DORIC-I2 which uses a differential pre-amp. The chips have been simulated from the extracted layout with parasitic capacitance plus the stray inductance and capacitance of wire bonds. The simulations predict both chips should work. We expect the delivery of the chips in February 2002.

We have annealed the five packaged VDC-I1's and DORIC-I1's that were irradiated in the cold box with 24 GeV protons at CERN. After more than one week of annealing at room temperature, we observe no change in the rise and fall time of the VDCs but they produce slightly more light. One DORIC requires significantly higher minimum PIN current for no bit errors. All DORICs show no degragation in the clock duty cycle.

1.1.1.3.2 Development/Prototypes

Milestone	Baseline	Previous	Forecast	Status
1st IBM prototype submitted (FE-I1)	26-Jul-01	--	12-Nov-01	Completed
1st IBM prototype delivered	24-Oct-01	--	19-Jan-02	Delayed (See #1)

Complete initial wafer probe FE-I1	7-Nov-01	--	1-Feb-02	Delayed (See #2)
First bump bonded FE-I1 assemblies arrive	9-Jan-02	--	15-Mar-02	Delayed (See #3)

Note #1 No official delivery date given yet, but second half of January is still likely.

Note #2 We expect to be able to complete the preliminary wafer probe within two weeks of receipt of wafers.

Note #3 We have been assured again that the bumping vendors will deliver assemblies within 6 weeks of receipt of wafers. Bumping of dummy 8" wafers has gone well, and so demonstration of capability is almost complete.

1.1.1.4 Flex Hybrids/Optical Hybrids

1.1.1.4.1 Design

Milestone	**Baseline**	**Previous**	**Forecast**	**Status**
Optical FDR	31-Jan-02	15-Feb-02	10-Oct-02	Delayed (See #1)
Release Flex Bids	24-Apr-02	24-Apr-02	1-Nov-02	Delayed (See #2)

Note #1 Have shifted this milestone to allow for testing IBM optical ICs and prototype optical boards during most of summer test beam period.

Note #2 This is delayed because of overall project delays. The forecast date depends on success of the FE-I electronics and only minor changes required in the production flex design from v4.

Rusty Boyd (University of Oklahoma)

Flex Hybrid Design (UOK)

Layout work for the flex hybrid v4.x design this was begun late this month. It is expected to be complete and submitted for fabrication before Christmas.

1.1.1.4.2 Development/Prototypes

Milestone	**Baseline**	**Previous**	**Forecast**	**Status**
Initial Flex 3.x tests complete	13-Dec-01	--	13-Dec-01	On Schedule

Rusty Boyd (University of Oklahoma)

Flex Hybrid Development (UOK)

Fifty good v3 flex hybrids were received in November in two shipments. We have done some measurements on a small sample of the flex hybrid test structures find that the resistance of the test traces are larger than expected for 13 micron thick Cu with Ni and Au plating. Our measurements indicate a thickness of from 7 to 10 microns, with an average of about 8 microns, but this assumes that the line widths of the test structures are as drawn. The test vias indicate an average resistance of about 0.007 Ohms. We will examine the remainder of the test structures in December.

One half of the v3 flex were built with Pyralux PC 1010 and the other half with Taiyo PSR 9000 cover layers. This was done out of concern that the Pyralux may be thinned too much over the bottom side traces when laminated. The PSR 9000 also has a much higher dielectric strength and therefore, a thinner layer may be used.

The flex circuits were scanned into picture files at high resolution to facilitate documentation of visible defects. Examination shows many features in the cover layer materials. Although it is not clear which of these, if any, are fatal defects, we hope to learn more about what to look for in production by carefully documenting and tracking each flex hybrid from now on. This is especially important as we develop specifications for the production contracts.

Bonn provided 50 frame PCB's and we have begun mounting flex on them. These boards provide support and connectivity to the flex during assembly and testing, including assembly onto the module and test, thereafter. Although these boards need some refinement in the layout, they provide the required features and should be very beneficial to the construction of flex hybrid modules. Samples of flex on frame have been provided to Albany, Genoa and SMD (Surface Mount Depot, OK). We expect to complete inspection and assembly of the flex on frame in December.

After assembly, the flex hybrids will be sent to Albany for HV hold off testing. After the first 10 are tested at 800 Vdc, we will evaluate the results. If there are a large number of failures (> 50%), we will continue testing at a lower voltage with the remainder. This is being done because once a failure has occurred, the hold off voltage is reduced, often below 150 V in the case of v2.x flex.

The first 25 flex hybrids to pass testing at Albany are to be sent to Bonn for mounting of the MCC and then on to Genoa for use in development of their test system. After testing, the remainder will be returned to UOK to send out to other groups as needed. AMS MCC's will be mounted on at least 5 flex hybrids at UOK for test system development.

A probe card has been designed and submitted for fabrication at Rucker and Kolls (CA). This will allow us to contact FE bond pad groups on either side of an assembled or unassembled flex hybrid for v3 and v4. We ordered two cards, the second one being for Albany. Although the v3 flex will be tested there using the same micropositioner probing system that was used for v2.x, the probe card should significantly speed HV tests in the future. Together with the frame PCB, the probe card provides connectivity to all the bottom traces on the flex circuit, eliminating the need for micropositioner based probing for the HV hold off test.

We have ordered the panels and other equipment needed for the clean room expansion. We are still awaiting a final estimate and schedule from the UOK Physical Plant for modifications and additions needed to complete the expansion. We have also received over $18k in UOK research money to complete funding for the clean room expansion.

Plans have been made with SMD to assemble the components onto 40 flex hybrids using Mydata automated pick and place machinery. Their engineering staff have examined the flex on frame assemblies and produced a plan for handling and assembling them. They also suggested leaving the frame PCB's in panel in the future so that many flex can be assembled with a single loading operation. One disadvantage to the current assembly plan is that they must discard one half of the 0402 size components. SMD does not have the optimal magazine for the Mydata, although they plan to purchase one for flex hybrid production. They have provided a quotation for v3 and R. Boyd will be observing the assembly on site in December. A set of assembly drawings and specifications is available on EDMS.

K.K. Gan (Ohio State)

We have annealed the opto-board that was mounted on the shuttle and irradiated with 24 GeV protons at CERN. The VCSEL light output of the four working links reaches a maximum after a week of annealing at room temperature with pseudo-random data with an amplitude of 20 mA. However, some of the light output remains low, <300 uW. Preliminary study indicates that the fibers coupled to the VCSEL are not the culprit. The rise and fall time of the VDC is slightly degraded. Given that the packaged VDCs irradiated in the cold box show no degradation when attached to non-irradiated VCSEL, we believe the degradation is in the VCSELs.

We have received the delivery of Opto-board III, the board that is designed to be compatible with both VDC-D3/DORIC-D3 and VDC-I1/DORIC-I1. One board has been populated in preparation for the testing VDC-D3/DORIC-D3.

1.1.1.4.3 Production

Milestone	**Baseline**	**Previous**	**Forecast**	**Status**
Start initial production buy of components	13-Dec-01	13-Dec-01	1-Nov-02	Delayed (See #1)

Note #1 Delayed until after PRR. There is no longer a critical shortage of components.

1.1.2 Silicon Strip System — Abe Seiden (University Of Calif. At Santa Cruz)

ATMEL is delivering wafers at a rapid pace and in December we expect to be able to start testing wafers with the new epi layer. Testing at Santa Cruz is somewhat slower (about 70% of final planned rate) of planned rate but we should be able to catch up as soon as our second probe station arrives next month. The test is also expected to be sped up by nearly a factor of two as we implement time saving features that we did not want to use till we gained experience. We now have available 7% of the chips needed for the full detector and we have begun dicing these chips to send to the Japanese cluster which is the first to begin producing modules.

In the module area LBNL has produced two electrical modules and dummy modules to test the metrology. The latter still needs significant work to meet the detector standards. On the component side all components are now in production and will soon be available. This has allowed the Japanese cluster to pass the rigorous qualification procedure by producing 5 excellent modules which meet the ATLAS spec in all regards. There going into production will help all the sites as they will have to get various systems up and running - for example the data-base. The U.S. cluster at LBNL continues to make progress as jigs are finalized and measurement techniques refined.

1.1.2.1 IC Electronics

1.1.2.1.1 Design

Milestone	Baseline	Previous	Forecast	Status
Release management contingency	1-Feb-02	--	1-Feb-02	On Schedule

Alexander A. Grillo (University Of Calif. At Santa Cruz)

LBNL & UCSC

The new version of the ABCD wafer test program, which incorporates some new tests on the I/O functions of the ABCD and also makes other changes to reduce test time, still has not been qualified for production. Some progress was made but the test results still differ from the present production version. Work on this is going slowly since we cannot devote too much tester time to this qualification, which takes away from production testing. Qualification testing is now running on the weekends to minimize interference with production testing.

Work is continuing to monitor power supply and distribution systems along with the grounding and shielding designs. We are having bi-weekly phone meetings with the power supply and cabling groups and Ned Spencer has organized a grounding and shielding workshop for RAL the first week of December.

1.1.2.1.2 Development/Prototypes

Milestone	Baseline	Previous	Forecast	Status
Test Systems Complete	3-Aug-01	--	31-Dec-01	Delayed (See #1)

Note #1 The wafer test systems are operational and qualified for production. Some work is continuing to reduce test time and add some improved tests. The new tests and revised test spec is complete. The qualification of the new tests was postponed until after the first production delivery of 35 wafers was tested so as to not hold up production schedule. The qualification of the new tests was not completed in October but is continuing. Also, work is ongoing to complete the spare parts for test systems. It is expected that all will be completed by year end.

Alexander A. Grillo (University Of Calif. At Santa Cruz)

LBNL & UCSC

Progress is continuing (mostly in Europe) to understand the post-rad Idd problem with the ABCD. X-ray data correlates well with the PS irradiation data indicating that an X-ray screen should work. Also, a re-measurement of Idd for modules that had been irradiated months ago and kept in cold storage indicates that annealing continues to lower the current draw. All of the modules annealed for more than 4 months had not returned to the pre-rad values but had dropped to an acceptable value. For this reason, we believe this problem will not be an issue in the real experiment. To confirm this, ATMEL is starting a study of the activation energy of the annealing process and we will perform an irradiation of 12 chips with the LBNL cobalt source at low dose rate and cold temperature. All these results should be complete by the end of February.

1.1.2.1.3 Production

Milestone	Baseline	Previous	Forecast	Status
1st ICs Avail for Prod Hybrids	4-Jan-02	--	4-Jan-02	On Schedule
10% Testing Complete	1-Feb-02	--	1-Feb-02	On Schedule
25% Testing Complete	27-Mar-02	--	27-Mar-02	On Schedule

Alexander A. Grillo (University Of Calif. At Santa Cruz)

LBNL & UCSC

Production of ABCD wafers is continuing on schedule. By month end CERN had received 395 production wafers with another 106 received the following week. Testing has not been keeping up with the schedule. This is partly due to CERN still not re-starting its testing effort and RAL and UCSC falling a little behind due to contact questions with the probe cards. At UCSC, we are completing about 7 wafers per week on average instead of the target 10. With the test time still running about 9+ hours per wafer, when there is any sort of glitch (e.g. trouble with prober or probe card) we lose one shift of testing or one wafer. This will be remedied as soon as the new production test is qualified (4.5 hours/wafer) and when the second probe station arrives at the end of January.

The yield continues to fluctuate from lot to lot. Of the lots completely or partially tested so far, the yields are: 14%, 29%, 30%, 9% and 26% with a cum yield of 23%. None of these lots so far tested used the new epi sub-contractor.

1.1.2.2 Hybrids/Cables/Fanouts

1.1.2.2.2 Development & Prototype Fabrication **Carl Haber (Lawrence Berkeley Lab.)**

Another K4 hybrid was assembled for us in radiation tests.

The K4 assembled and tested successfully in Nov experienced problems during fanout wirebonding. This was due to poor surface quality and etching on the fanout. These problems led to the loss of a few channels. The hybrid fabrication group has been advised of these problems.

An additional provisional hybrid bonding and rework fixture as well as dummy hybrids have been made and sent to UC Santa Cruz. This will enable that group to prepare for production.

Some of the MPP parts have been received from the shops.

1.1.2.2.3 Production

Milestone	Baseline	Previous	Forecast	Status
1st Preproduction Hybrids Avail for Mod Assy	4-Jun-01	--	15-Dec-01	Delayed (See #1)
Compl Preproduction Assy	13-Aug-01	--	21-Jan-02	Delayed (See #2)
Compl Testing of Preprod Hybrid	3-Sep-01	--	21-Feb-02	Delayed (See #3)
1st Prod Hybrids Avail for Mod Assy	8-Feb-02	--	8-Mar-02	Delayed (See #4)

Note #1 This will follow the hybrid design review and is set by Japanese procurement schedule. The FDR is complete but some minor mods have been circulated. We have not received word that the hybrids are available from the Japanese.

Note #2-3 Set by date of item1 above.

Note #4 Due to slips above this is shifted one month.

Carl Haber (Lawrence Berkeley Lab.)

Some of the MPP parts have been received from the shops. We still await notification that the pre-production hybrids are ready for us. A description of the proposed US hybrid plan was included in the talk prepared for the upcoming Dec 2001 SCT week.

1.1.2.3 Module Assembly and Test

1.1.2.3.1 Design of Assembly & Test Tooling

Milestone	Baseline	Previous	Forecast	Status
Compl Design of Preprod Mod Assy/Test	3-Sep-01	--	3-Feb-02	Delayed (See #1)
Module PRR	3-Sep-01	--	8-Mar-02	Delayed (See #2)
Compl Design of Prod Mod Assy/Test	8-Feb-02	--	8-Mar-02	Delayed (See #3)

Note #1 Now that the fixation point is settled fixtures have to be modified and tested.

Note #2 Given the delay discussed in #1 above this is the current expected date for the US module assembly PRR.

Note #3 Slipped due to 1) above.

Carl Haber (Lawrence Berkeley Lab.)

Discussion of possible mods to the module pickup tool wit the UK group took place.

1.1.2.3.2 Development & Prototypes **Carl Haber (Lawrence Berkeley Lab.)**

A second electrical module was completed. It functions. There are some bad channels due to the bonding problems on the fanout described earlier. Some evidence of oscillation was seen on the backside chips of this second module. The RAL baseboard support place was received and inspected. The new spots code was installed and is in test. The metrology process was coded and tested on the dummy module using the Smart Scope. A spreadsheet was written to perform the various analyses and is being de-bugged. Perl code from the UK was installed at LNL for metrology analyses. Glass wafers were ordered for additional dummy detectors.

1.1.2.3.3 Production

Milestone	**Baseline**	**Previous**	**Forecast**	**Status**
Complete Preproduction Module Assembly	30-Jul-01	--	1-Mar-02	Delayed (See #1)
Complete Preproduction Module Testing	3-Sep-01	--	15-Mar-02	Delayed (See #2)
Start Full Strip Module Production	7-Jan-02	--	15-Mar-02	Delayed (See #3)

Note #1-2 Require pre-production hybrids which are still unavailable from Japan. Requires validation of new fixtures now that fixation point is settled.

Note #3 Defined as date of module assembly PRR.

Carl Haber (Lawrence Berkeley Lab.)

Work continues on mods to the folding fixture. A detailed production schedule was drafted and included in the presentation package for the Dec 2001 SCT week.

1.1.3 ROD Design & Fabrication **Dick Jared (Lawrence Berkeley Lab.)**

VHDL code for the ROD has been upgraded. Significant progress has been made on Pixel specific VHDL code. The completed pixel code will be needed in March for initial board testing. The VHDL code has been converted to be compatible with the production model cards. The Formater and Controller VHDL is under testing to find/understand some problems. Testing is on going to find defects.

The ROD has been upgraded to the production model. Production model cards (4 ea.) have been fabricated and loaded. It is expected to have the early fabrication and debugging of production models (4 ea.) completed in late January or early February. These cards will be needed for user evaluation of the ROD in the system test.

Code for the slave DSP is being upgraded to the new TI library. This is needed to have the interrupts work correctly.

1.1.3.4 ROD Test Stand

1.1.3.4.3 SCT/Pixel Test Stand Software

Milestone	Baseline	Previous	Forecast	Status
Production Diagnostic Test Stand Completed	29-Sep-00	--	29-Apr-02	Delayed (See #1)

Note #1 The test stand software is completely functional for the production testing. This software will be updated for more efficiency in the next few months. The minor improvements to the software will continue till the mid part of FY 02.

1.1.3.6 ROD Prototype Evaluation

1.1.3.6.3 User Evaluation of ROD in Europe

Milestone	Baseline	Previous	Forecast	Status
SCT ATLAS Final Design Review	11-Jun-01	--	15-May-02	Delayed (See #1)
SCT ROD User Evaluation Complete	1-Oct-01	--	15-Apr-02	Delayed (See #2)
Pixel ATLAS Final Design Review	1-Jan-02	--	1-May-02	Delayed (See #3)

Note #1 The new schedule forecast a date of 4/3/02 for this review. At that time the BOC and ROD should be ready for the review.

Note #2 The complete user evaluation is predicated as completion of the production model of the BOC and ROD. The prototype TIM will be used for the testing. The limiting factor is completion of the initial SCT DAQ. The SCT DAQ prototype is schedule to be completed in October of 2001 and the usable DAQ will be ready in January of 2002. The DAQ and cards will be used at CERN in December 2001 to early April 2002 to verify that the SCT Off Detector Electronics function as expected.

Note #3 The current new schedule predicated on user evaluation assumes the review will be late in FT 02.

1.1.3.7 ROD Production Model

1.1.3.7.1 Updating of ROD to Production Model

Milestone	Baseline	Previous	Forecast	Status
SCT ATLAS ROD PRR	1-Oct-01	--	15-Nov-02	Delayed (See #1)

Note #1 The PRR is contingent on completion of the user evaluation. Please see 1.1.3.6.3 SCT ROD user evaluation complete for details.

1.1.3.7.3 Evaluation of Production Model

Milestone	Baseline	Previous	Forecast	Status
Pixel ROD Design complete	14-Jun-01	--	15-Feb-02	Delayed (See #1)

Note #1 The VHDL is still under development. It is projected to be completed and evaluated by Feb 02.

1.1.3.8 ROD Fabrication

1.1.3.8.1 ROD 5% Production

Milestone	Baseline	Previous	Forecast	Status
Begin First End Cap SCT Module Ass/Test	25-Nov-01	--	25-Apr-02	Delayed (See #1)
Begin First Barrel SCT Module Ass/Test	27-Dec-01	--	27-Apr-02	Delayed (See #2)
Release Management Contingency	2-Apr-02	--	2-Apr-02	On Schedule
ROD 5% Production complete	2-Apr-02	--	2-Apr-02	On Schedule
First SCT Full Assembly Test Start	16-Apr-02	--	16-Apr-02	On Schedule

Note #1-2 These dates are not known well because of assembly site slippage.

1.1.3.8.2 SCT ROD Production

Milestone	Baseline	Previous	Forecast	Status
ROD 45% Production complete	16-Jan-02	--	1-Oct-03	Delayed (See #1)

Note #1 The production can not start till ATLAS has significant user evaluation and a review of the Pixel Off-detector Electronics.

1.2 TRT

Milestones with changed forecast dates:

1.2.1.1.3 Production

Milestone	Baseline	Previous	Forecast	Status
Module Assy #3 Duke & IU Module Assy CUM #4 Complete	31-May-01	1-Nov-01	1-Dec-01	Delayed (See #1)
HV Plates (Module #2) CUM #15 Available	31-May-01	1-Nov-01	1-Dec-01	Delayed (See #2)
HV Plates (Module #2) CUM #17 Available	29-Jun-01	29-Nov-01	31-Dec-01	Delayed (See #3)
Module Assy #2 Duke Module Assy CUM #11 Complete	29-Jun-01	29-Dec-01	30-Nov-01	Completed
Shells (Module #3) CUM #13 Available	29-Jun-01	29-Nov-01	31-Dec-01	Delayed (See #4)
Shells (Module #3) CUM #14 Available	31-Jul-01	1-Nov-01	31-Jan-02	Delayed (See #5)
HV Plates (Module #2) CUM #18 Available	31-Jul-01	1-Nov-01	1-Jan-02	Delayed (See #6)
Module Assy #2 Duke Module Assy CUM #13 Complete	31-Jul-01	30-Nov-01	30-Dec-01	Delayed (See #7)
Module Assy #3 Duke & IU Module Assy CUM #8 Complete	31-Jul-01	1-Dec-01	31-Dec-01	Delayed (See #8)
Shells (Module #3) CUM #15 Available	31-Aug-01	1-Nov-01	31-Jan-02	Delayed (See #9)
HV Plates (Module #2) CUM #21 Available	28-Sep-01	28-Nov-01	28-Jan-02	Delayed (See #10)
HV Plates (Module #3) CUM #16 Available	28-Sep-01	28-Dec-01	28-Jan-02	Delayed (See #11)
Module Assy #1 IU Module Assy CUM #17 Complete	28-Sep-01	28-Nov-01	28-Dec-01	Delayed (See #12)
Module Assy #2 Duke Module Assy CUM #17 Complete	28-Sep-01	28-Nov-01	28-Jan-02	Delayed (See #13)
Wire Joints -2 CUM #19 (200/m) Available	28-Sep-01	28-Nov-01	28-Dec-01	Delayed (See #14)
CUM #54 Kit Available	28-Sep-01	28-Nov-01	28-Feb-02	Delayed (See #15)
HV Plates (Module #3) CUM #17 Available	31-Oct-01	1-Nov-01	1-Feb-02	Delayed (See #16)
Module Assy #1 IU Module Assy	31-Oct-01	1-Nov-01	1-Feb-02	Delayed (See #17)

CUM #19 Complete				
Wire Joints -1 CUM #100 (600/m) Available	29-Nov-01	29-Nov-01	28-Feb-02	Delayed (See #18)
Module Assy #2 Duke Module Assy CUM #21 Complete	30-Nov-01	30-Nov-01	30-Mar-02	Delayed (See #19)
Wire Joints -2 CUM #23 (200/m) Available	30-Nov-01	30-Nov-01	30-Mar-02	Delayed (See #20)
Wire Joints -1 CUM #52 (600/m) Available	30-Nov-01	30-Nov-01	30-Mar-02	Delayed (See #21)
Shells (Module #3) CUM #18 Available	30-Nov-01	30-Nov-01	30-Dec-01	Delayed (See #22)
Module Assy #3 Duke & IU Module Assy CUM #15 Complete	30-Nov-01	30-Nov-01	30-Nov-02	Delayed (See #23)
Module Assy #1 IU Module Assy CUM #21 Complete	30-Nov-01	30-Nov-01	30-Mar-02	Delayed (See #24)
HV Plates (Module #2) CUM #23 Available	30-Nov-01	30-Nov-01	30-Mar-02	Delayed (See #25)
HV Plates (Module #1) CUM #24 Available	30-Nov-01	30-Nov-01	30-Mar-02	Delayed (See #26)
CUM #66 Kit Available	30-Nov-01	30-Nov-01	30-Nov-02	Delayed (See #27)
CUM #37 Test Complete	30-Nov-01	30-Nov-01	30-Nov-02	Delayed (See #28)
CUM #30,100 Available from Hampton	30-Nov-01	30-Nov-01	30-Dec-01	Delayed (See #29)
CUM #1 Test Complete	30-Nov-01	30-Nov-01	30-Dec-01	Delayed (See #30)
Shells (Module #2) CUM #23 Available	30-Nov-01	30-Nov-01	30-Dec-01	Delayed (See #31)

Note #1-2 Delayed due to pause.
Note #3-31 Delayed.

1.2.5.1.2 Prototype

Milestone	**Baseline**	**Previous**	**Forecast**	**Status**
ASDBLR Design Frozen	13-Jul-01	15-Nov-01	15-Jan-02	Delayed (See #1)
Production Readiness Review	11-Jan-02	11-Jan-02	15-Jan-02	Delayed (See #2)

Note #1 The new "properly processed" wafers arrived in mid July and plastic packaged parts were delivered on the 31st. Preliminary measurements indicate that matching and other functionality is as expected (hoped), however, the noise measurements are not as good as the SPice simulations would have indicated. We now believe we understand the cause of this discrepancy and have submitted metalization changes to ATMEL that should clear up the effect. Those wafers should be available in early November and so it is possible that we would be able to settle on a final configuration in mid November. This note from the last two months is still the case except that work on completing the DSM blocks has prevented serious noise measurements on the returned ASDBLRs - preliminary yield measurements look good, so we did not screw up big time, but we don't yet know how much we won. Completion of the DSM work in early December means we will be able to make the noise and protection comparisons by Xmas. We still need to settle on a final PRR date, but these should all come together in Jan 2002.

Note #2 Based on getting noise and input protection information from the remetalled wafers in mid November plus completing all other tests and people availability will put a PRR (or whatever we call it) in mid January or somewhat later - final date will be set after first round measurements. See previous note form a bit more detail.

1.2.5.1.3 Production (Qty = 64,000 + 32,000 Chips)

Milestone	Baseline	Previous	Forecast	Status
Management Contingency Go-Ahead	2-Jul-01	15-Dec-01	15-Feb-02	Delayed (See #1)

Note #1 As noted in the prototyping report, we have preliminary evidence that we understand the ASDBLR noise behavior and thus should be in a position to go ahead with a PRR (or whatever we want to call it) early in 2002. Because of new CERN travel restrictions we may wind up using a day in the Feb. TRT week - slightly later than desired, but maybe not too bad - especially if we can have the paper work ready for all the go-aheads and purchasing steps for a production order prior to that time so that a green light from the review can result in immediate action in procurement.

1.2.5.6 System Integration & installation

Milestone	Baseline	Previous	Forecast	Status
System Design Certified	1-Oct-01	1-Jan-02	28-Feb-02	Delayed (See #1)

Note #1 Well, there are really two different systems - the End Cap where we have made great progress, but probably need to have one more round of tests using the 00 (i.e. "final") level silicon. This is waiting on CERN to finish the minor revisions to the boards and so is probably likely around the new year. For the Barrel we have not yet really gotten a viable full design so that must be achieved prior to being able to "certify" it. That process will surely take us beyond the first of the year, but new stamp boards and FBGA packages should be available to start first serious testing at about the new year. This note from last month still applies but I have chivied the date later a bit to be somewhat more realistic.

1.2.1 Barrel Mechanics

1.2.1.1 Barrel Module — Ken McFarlane (Hampton University)

1.2.1.1.3 Production

Milestone	Baseline	Previous	Forecast	Status
HV Plates (Module #3) CUM #5 Available	28-Feb-01	--	30-Nov-01	Completed
CUM #5 Test Complete	30-Apr-01	--	30-Dec-01	Delayed (See #1)
CUM #9 Test Complete	31-May-01	--	1-Dec-01	Delayed (See #2)
HV Plates (Module #2) CUM #15 Available	31-May-01	1-Nov-01	1-Dec-01	Delayed (See #3)

HV Plates (Module #3) CUM #12 Available	31-May-01	--	31-Dec-01	Delayed (See #4)

Module Assy #3 Duke & IU Module Assy CUM #4 Complete	31-May-01	1-Nov-01	1-Dec-01	Delayed (See #5)
Shells (Module #3) CUM #12 Available	31-May-01	--	31-Dec-01	Delayed (See #6)
HV Plates (Module #2) CUM #17 Available	29-Jun-01	29-Nov-01	31-Dec-01	Delayed (See #7)
HV Plates (Module #3) CUM #13 Available	29-Jun-01	--	29-Dec-01	Delayed (See #8)
Module Assy #2 Duke Module Assy CUM #11 Complete	29-Jun-01	29-Dec-01	30-Nov-01	Completed
Module Assy #3 Duke & IU Module Assy CUM #6 Complete	29-Jun-01	--	29-Dec-01	Delayed (See #9)
Shells (Module #3) CUM #13 Available	29-Jun-01	29-Nov-01	31-Dec-01	Delayed (See #10)
Mangement Contingency Go-Ahead	2-Jul-01	--	2-Dec-01	Delayed (See #11)
CUM #42 Kit Available	31-Jul-01	--	31-Dec-01	Delayed (See #12)
HV Plates (Module #2) CUM #18 Available	31-Jul-01	1-Nov-01	1-Jan-02	Delayed (See #13)
HV Plates (Module #3) CUM #14 Available	31-Jul-01	--	31-Dec-01	Delayed (See #14)
Module Assy #2 Duke Module Assy CUM #13 Complete	31-Jul-01	30-Nov-01	30-Dec-01	Delayed (See #15)
Module Assy #3 Duke & IU Module Assy CUM #8 Complete	31-Jul-01	1-Dec-01	31-Dec-01	Delayed (See #16)
Shells (Module #3) CUM #14 Available	31-Jul-01	1-Nov-01	31-Jan-02	Delayed (See #17)
CUM #48 Kit Available	31-Aug-01	--	31-Dec-01	Delayed (See #18)
HV Plates (Module #2) CUM #19 Available	31-Aug-01	--	31-Dec-01	Delayed (See #19)
HV Plates (Module #3) CUM #15 Available	31-Aug-01	--	31-Dec-01	Delayed (See #20)
Module Assy #2 Duke Module Assy CUM #15 Complete	31-Aug-01	--	31-Dec-01	Delayed (See #21)
Module Assy #3 Duke & IU Module Assy CUM #10 Complete	31-Aug-01	--	1-Dec-01	Delayed (See #22)
Shells (Module #3) CUM #15 Available	31-Aug-01	1-Nov-01	31-Jan-02	Delayed (See #23)
CUM #25,400 Available from Hampton	28-Sep-01	--	28-Nov-01	Completed
CUM #54 Kit Available	28-Sep-01	28-Nov-01	28-Feb-02	Delayed (See #24)
HV Plates (Module #1) CUM #21 Available	28-Sep-01	--	28-Nov-01	Completed
HV Plates (Module #2) CUM #21 Available	28-Sep-01	28-Nov-01	28-Jan-02	Delayed (See #25)
HV Plates (Module #3) CUM #16 Available	28-Sep-01	28-Dec-01	28-Jan-02	Delayed (See #26)
Module Assy #1 IU Module Assy CUM #17 Complete	28-Sep-01	28-Nov-01	28-Dec-01	Delayed (See #27)
Module Assy #2 Duke Module Assy CUM #17 Complete	28-Sep-01	28-Nov-01	28-Jan-02	Delayed (See #28)
Module Assy #3 Duke & IU Module Assy	28-Sep-01	--	28-Dec-01	Delayed (See #29)

CUM #12 Complete				
Shells (Module #3) CUM #16 Available	28-Sep-01	--	28-Dec-01	Delayed (See #30)
Wire Joints -1 CUM #44 (600/m) Available	28-Sep-01	--	28-Dec-01	Delayed (See #31)
Wire Joints -2 CUM #19 (200/m) Available	28-Sep-01	28-Nov-01	28-Dec-01	Delayed (See #32)
CUM #25 Test Complete	30-Sep-01	--	31-May-02	Delayed (See #33)
CUM #27,800 Available from Hampton	31-Oct-01	--	31-Dec-01	Delayed (See #34)
CUM #31 Test Complete	31-Oct-01	--	31-Oct-02	Delayed (See #35)
CUM #34,843 Available from CERN	31-Oct-01	--	31-Dec-01	Delayed (See #36)
CUM #60 Kit Available	31-Oct-01	--	31-Dec-01	Delayed (See #37)
HV Plates (Module #1) CUM #22 Available	31-Oct-01	--	31-Dec-01	Delayed (See #38)
HV Plates (Module #2) CUM #22 Available	31-Oct-01	--	31-Dec-01	Delayed (See #39)
HV Plates (Module #3) CUM #17 Available	31-Oct-01	1-Nov-01	1-Feb-02	Delayed (See #40)
Module Assy #1 IU Module Assy CUM #19 Complete	31-Oct-01	1-Nov-01	1-Feb-02	Delayed (See #41)
Module Assy #2 Duke Module Assy CUM #19 Complete	31-Oct-01	--	31-Dec-01	Delayed (See #42)
Module Assy #3 Duke & IU Module Assy CUM #14 Complete	31-Oct-01	--	31-Dec-01	Delayed (See #43)
Modules Production A Complete	31-Oct-01	--	31-Dec-01	Delayed (See #44)
Shells (Module #1) CUM #22 Available	31-Oct-01	--	31-Dec-01	Delayed (See #45)
Shells (Module #2) CUM #22 Available	31-Oct-01	--	31-Dec-01	Delayed (See #46)
Shells (Module #3) CUM #17 Available	31-Oct-01	--	31-Dec-01	Delayed (See #47)
Wire Joints -1 CUM #48 (600/m) Available	31-Oct-01	--	31-Dec-01	Delayed (See #48)
Wire Joints -2 CUM #21 (200/m) Available	31-Oct-01	--	31-Dec-01	Delayed (See #49)
Wire Joints -1 CUM #100 (600/m) Available	29-Nov-01	29-Nov-01	28-Feb-02	Delayed (See #50)
CUM #1 Test Complete	30-Nov-01	30-Nov-01	30-Dec-01	Delayed (See #51)
CUM #30,100 Available from Hampton	30-Nov-01	30-Nov-01	30-Dec-01	Delayed (See #52)
CUM #37 Test Complete	30-Nov-01	30-Nov-01	30-Nov-02	Delayed (See #53)
CUM #37,143 Available from CERN	30-Nov-01	--	30-Nov-01	Completed
CUM #66 Kit Available	30-Nov-01	30-Nov-01	30-Nov-02	Delayed (See #54)
HV Plates (Module #1) CUM #24 Available	30-Nov-01	30-Nov-01	30-Mar-02	Delayed (See #55)
HV Plates (Module #2) CUM #23 Available	30-Nov-01	30-Nov-01	30-Mar-02	Delayed (See #56)
Module Assy #1 IU Module Assy CUM #21 Complete	30-Nov-01	30-Nov-01	30-Mar-02	Delayed (See #57)
Module Assy #2 Duke Module Assy CUM #21 Complete	30-Nov-01	30-Nov-01	30-Mar-02	Delayed (See #58)
Module Assy #3 Duke & IU Module Assy	30-Nov-01	30-Nov-01	30-Nov-02	Delayed (See #59)

CUM #15 Complete				
Shells (Module #1) CUM #24 Available	30-Nov-01	--	30-Nov-01	Completed
Shells (Module #2) CUM #23 Available	30-Nov-01	30-Nov-01	30-Dec-01	Delayed (See #60)
Shells (Module #3) CUM #18 Available	30-Nov-01	30-Nov-01	30-Dec-01	Delayed (See #61)
Wire Joints -1 CUM #52 (600/m) Available	30-Nov-01	30-Nov-01	30-Mar-02	Delayed (See #62)
Wire Joints -2 CUM #23 (200/m) Available	30-Nov-01	30-Nov-01	30-Mar-02	Delayed (See #63)
CUM #32,500 Available from Hampton	31-Dec-01	--	31-Dec-01	On Schedule
CUM #39,443 Available from CERN	31-Dec-01	--	31-Dec-01	On Schedule
CUM #43 Test Complete	31-Dec-01	--	31-Dec-01	On Schedule
CUM #71 Kit Available	31-Dec-01	--	31-Dec-01	On Schedule
HV Plates (Module #1) CUM #25 Available	31-Dec-01	--	31-Dec-01	On Schedule
HV Plates (Module #2) CUM #25 Available	31-Dec-01	--	31-Dec-01	On Schedule
HV Plates (Module #3) CUM #19 Available	31-Dec-01	--	31-Dec-01	On Schedule
Module Assy #2 Duke Module Assy CUM #22 Complete	31-Dec-01	--	31-Dec-01	On Schedule
Module Assy #3 Duke & IU Module Assy CUM #16 Complete	31-Dec-01	--	31-Dec-01	On Schedule
Shells (Module #1) CUM #25 Available	31-Dec-01	--	31-Dec-01	On Schedule
Shells (Module #2) CUM #25 Available	31-Dec-01	--	31-Dec-01	On Schedule
Shells (Module #3) CUM #19 Available	31-Dec-01	--	31-Dec-01	On Schedule
Wire Joints -1 CUM #56 (600/m) Available	31-Dec-01	--	31-Dec-01	On Schedule
Wire Joints -2 CUM #25 (200/m) Available	31-Dec-01	--	31-Dec-01	On Schedule
CUM #35,000 Available from Hampton	31-Jan-02	--	31-Jan-02	On Schedule
CUM #41,743 Available from CERN	31-Jan-02	--	31-Jan-02	On Schedule
CUM #49 Test Complete	31-Jan-02	--	31-Jan-02	On Schedule
CUM #75 Kit Available	31-Jan-02	--	31-Jan-02	On Schedule
HV Plates (Module #1) CUM #26 Available	31-Jan-02	--	31-Jan-02	On Schedule
HV Plates (Module #2) CUM #26 Available	31-Jan-02	--	31-Jan-02	On Schedule
HV Plates (Module #3) CUM #20 Available	31-Jan-02	--	31-Jan-02	On Schedule
Module Assy #1 IU Module Assy CUM #24 Complete	31-Jan-02	--	31-Jan-02	On Schedule
Module Assy #2 Duke Module Assy CUM #24 Complete	31-Jan-02	--	31-Jan-02	On Schedule
Module Assy #3 Duke & IU Module Assy CUM #17 Complete	31-Jan-02	--	31-Jan-02	On Schedule
Shells (Module #1) CUM #26 Available	31-Jan-02	--	31-Jan-02	On Schedule
Shells (Module #2) CUM #26 Available	31-Jan-02	--	31-Jan-02	On Schedule

Shells (Module #3) CUM #20 Available	31-Jan-02	--	31-Jan-02	On Schedule
Wire Joints -1 CUM #60 (600/m) Available	31-Jan-02	--	31-Jan-02	On Schedule
Wire Joints -2 CUM #27 (200/m) Available	31-Jan-02	--	31-Jan-02	On Schedule

CUM #37,250 Available from Hampton	28-Feb-02	--	28-Feb-02	On Schedule
CUM #44,043 Available from CERN	28-Feb-02	--	28-Feb-02	On Schedule
CUM #55 Test Complete	28-Feb-02	--	28-Feb-02	On Schedule
CUM #79 Kit Available	28-Feb-02	--	28-Feb-02	On Schedule
HV Plates (Module #1) CUM #28 Available	28-Feb-02	--	28-Feb-02	On Schedule
HV Plates (Module #2) CUM #27 Available	28-Feb-02	--	28-Feb-02	On Schedule
HV Plates (Module #3) CUM #21 Available	28-Feb-02	--	28-Feb-02	On Schedule
Module Assy #1 IU Module Assy CUM #25 Complete	28-Feb-02	--	28-Feb-02	On Schedule
Module Assy #2 Duke Module Assy CUM #25 Complete	28-Feb-02	--	28-Feb-02	On Schedule
Module Assy #3 Duke & IU Module Assy CUM #18 Complete	28-Feb-02	--	28-Feb-02	On Schedule
Module Assy #3 Duke & IU Module Assy CUM #34 Complete	28-Feb-02	--	28-Feb-02	On Schedule
Shells (Module #1) CUM #28 Available	28-Feb-02	--	28-Feb-02	On Schedule
Shells (Module #2) CUM #27 Available	28-Feb-02	--	28-Feb-02	On Schedule
Shells (Module #3) CUM #21 Available	28-Feb-02	--	28-Feb-02	On Schedule
Wire Joints -1 CUM #64 (600/m) Available	28-Feb-02	--	28-Feb-02	On Schedule
Wire Joints -2 CUM #29 (200/m) Available	28-Feb-02	--	28-Feb-02	On Schedule
CUM #40,000 Available from Hampton	29-Mar-02	--	29-Mar-02	On Schedule
CUM #63 Test Complete	29-Mar-02	--	29-Mar-02	On Schedule
CUM #82 Kit Available	29-Mar-02	--	29-Mar-02	On Schedule
HV Plates (Module #1) CUM #29 Available	29-Mar-02	--	29-Mar-02	On Schedule
HV Plates (Module #2) CUM #29 Available	29-Mar-02	--	29-Mar-02	On Schedule
HV Plates (Module #3) CUM #22 Available	29-Mar-02	--	29-Mar-02	On Schedule
Module Assy #1 IU Module Assy CUM #26 Complete	29-Mar-02	--	29-Mar-02	On Schedule
Module Assy #2 Duke Module Assy CUM #26 Complete	29-Mar-02	--	29-Mar-02	On Schedule
Module Assy #3 Duke & IU Module Assy CUM #19 Complete	29-Mar-02	--	29-Mar-02	On Schedule
Shells (Module #1) CUM #29 Available	29-Mar-02	--	29-Mar-02	On Schedule
Shells (Module #2) CUM #29 Available	29-Mar-02	--	29-Mar-02	On Schedule
Shells (Module #3) CUM #22 Available	29-Mar-02	--	29-Mar-02	On Schedule
Wire Joints -1 CUM #68 (600/m) Available	29-Mar-02	--	29-Mar-02	On Schedule
Wire Joints -2 CUM #31 (200/m) Available	29-Mar-02	--	29-Mar-02	On Schedule

CUM #46,343 Available from CERN	31-Mar-02	--	31-Mar-02	On Schedule
CUM #42,500 Available from Hampton	30-Apr-02	--	30-Apr-02	On Schedule
CUM #48,643 Available from CERN	30-Apr-02	--	30-Apr-02	On Schedule
CUM #71 Test Complete	30-Apr-02	--	30-Apr-02	On Schedule
CUM #86 Kit Available	30-Apr-02	--	30-Apr-02	On Schedule
HV Plates (Module #1) CUM #30 Available	30-Apr-02	--	30-Apr-02	On Schedule
HV Plates (Module #2) CUM #30 Available	30-Apr-02	--	30-Apr-02	On Schedule
HV Plates (Module #3) CUM #23 Available	30-Apr-02	--	30-Apr-02	On Schedule
Module Assy #1 IU Module Assy CUM #28 Complete	30-Apr-02	--	30-Apr-02	On Schedule
Module Assy #2 Duke Module Assy CUM #28 Complete	30-Apr-02	--	30-Apr-02	On Schedule
Module Assy #3 Duke & IU Module Assy CUM #20 Complete	30-Apr-02	--	30-Apr-02	On Schedule
Shells (Module #1) CUM #30 Available	30-Apr-02	--	30-Apr-02	On Schedule
Shells (Module #2) CUM #30 Available	30-Apr-02	--	30-Apr-02	On Schedule
Shells (Module #3) CUM #23 Available	30-Apr-02	--	30-Apr-02	On Schedule
Wire Joints -1 CUM #72 (600/m) Available	30-Apr-02	--	30-Apr-02	On Schedule
Wire Joints -2 CUM #33 (200/m) Available	30-Apr-02	--	30-Apr-02	On Schedule

Note #1 Testing at Hampton still not operational.

Note #2, 3, 5 Delayed due to pause.

Note #4 Delayed due to HV 3 plates.

Note #6 Shells are keeping up with production but are delayed WRT schedule.

Note #7, 10, 12-32, 34-63 Delayed.

Note #8, 9 HV plates delayed.

Note #11 Delayed until October when our production rates will be clearer.

Seog Oh (Duke University)

WireJoint Aging Test

The aging test for the wirejoint is continuing. In order to identify the cause for the glass etching, we made two runs. One run is with a gas mixture without CF_4, and the other is with CF_4 but with better moisture control. The moisture level for this run was less than 300 ppm. (The first run was well above 1000 ppm.) Form the two runs, we believe that it is the combination of CF_4 gas (radicals produced from it) and moisture etches the glass. Even in the run with controlled moisture level, glass beads were still etched (but slightly). (This does not mean it is safe to use glass beads for the LHC run since charge dosage in these runs was still a factor of 50 less than expected charge dosage.)

Another study we performed was to test various material and glues under the running condition. We made wirejoint with various materials:

1. peek wire joint
2. epoxy covered glass wirejoints
3. glass wirejoint encapsulated inside polyester tube and glue
4. wirejoint made with epoxy and kapton tube

After three weeks of operation, the wires were pulled out for inspection. We found that none of the wirejoints showed any sign of damage. It seems that plastics and epoxies are inert to CF_4 radicals produced in the chamber. Again, the total charge dosage is about a factor of 50 less than expected LHC dosage.

Preparation of another aging test chamber

We are constructing another chamber for the aging test. This chamber has 45 straws rather than 11 straws for the present aging test. This is also designed to supply two different types of gas mixtures. The plan is to test a gas mixture with CF_4 and without CF_4. A duplicated chamber will be sent to IU for a similar setup. Because of large number of straws, we can test several types of wirejoints under varying parameters. We expect to finish the construction and testing by the end of December. The first results will be reported at the February TRT meeting.

Module Construction

Because of the wirejoint problem, we are only continuing with the mechanical construction of modules. We are in the process of constructing 3.04 and 2.12.

Gas flow measurement.

One of the action items is to measure the gas flow uniformity in straws. For proper operation of modules, uniform gas flow rate is important. A few years ago, we measured the flow rate using a prototype Type I module, and found that the flow rate was uniform in all straws within ~30%. We are in the process of measuring the flow rate in Type 2 and Type 3. The technique of measuring the flow rate is to change the gas composition slightly for a period of time (~5 min) and observe the gain change along the straw length using the X-ray scanner as a function of time.

Harold Ogren (Indiana University)

Shells

Vison Composites have increased their goal to deliver about 6 modules a month. They were waiting for material for most of the month, but did produce several shells and began reworking several modules during this period.

Dividers

A local machine shop that produced the original dividers is in beginning to produce the remaining divider machined foils. These should be completed in December and will not result in any delays.

Modules

We are continuing with the mechanical side of production, that is, completion of the module up to the point of stringing, including the first pressure test and fitting of the tension plates. We were able to accelerate the number of starts by adding one additional assembly and alignment table.

Wire Joint Testing

After the initial radiation test at Duke, that indicated the glass joints were failing with in a short time, we ran a series of tests with a small straw aging test setup that had been built by Dave Rust for wire aging tests last year. In a few days we were able to accumulate about the same amount of Coulombs/cm as Duke, but in a small region upstream of the glass joint. We confirmed the severe etching of the joint with the Ar-CF_4-$C0_2$ mixture. We then ran a similar test with Ar-$C0_2$ and saw no etching at all. We did not have a good measure of the water content for either measurement. We ordered a precision water fraction meter (5-1000 ppm) which we are now using to study the effects of water on the process.

Duke University is building two larger test setups for more complete studies of new wire joints and non-CF_4 gas mixtures (see Duke report).

We have ordered an x-ray irradiation source and are building a radiation enclosure that should be ready the first of January. This should allow us to produce very high currents at nominal wire gain to evaluate new wire joints and binary gas mixtures. We hope to have some first results by the February meeting at CERN.

We have concluded that the glass wire joint cannot be operated in the standard mixture of Xe-CF_4-CO_2 at high radiation. This is a considerable setback. We are developing several alternatives. One is a change of gas mixture which would allow us to use the present glass wire joints, the other, the design and production of a new type wire joint that will be not destroyed during high radiation operation of the chamber. Both paths will require extensive testing, but the change of gas for both barrel and endcaps would also require aging tests for both systems.

New Radiator Production at Indiana University

We have moved one of the stringing stations from Indiana to Hampton and brought the radiator assembly work from Hampton to Indiana. We are now producing radiator packs at Indiana. This employs a technician full time making about one module radiator kit/day.

Ken McFarlane (Hampton University)

1.2.1.1.3 Production

Staff

We have a total of 6 technicians (including the QA tech, who now does assembly work on tension plates and capacitor barrels, and works on the Module Test Stand). This month, our tasks were somewhat re-organized: radiator pack manufacture moved to Indiana. We are in the process of re-optimizing our workflow.

1.2.1.1.3.1 Detector Elements

1.2.1.1.3.1.1 Straws

A shipment of 5566 straws arrived from PNPI.

1.2.1.1.3.1.1.2 End sockets (end plugs)

1.2.1.1.3.1.1.4.1 Twister

1.2.1.1.3.1.1.4.2 Twister

1.2.1.1.3.1.1.8.2 Wire bushing (eyelet)

1.2.1.1.3.1.1.8.3 Crimp pin (taper pin)

1.2.1.1.3.1.1.8.5, 6 Gas connections

All original purchase orders or contracts for the above components have been placed, and deliveries are complete. An order for new gas connections has been placed, to improve performance.

1.2.1.1.3.4 Assembly

Straw Subassemblies

Production continued with no special difficulties. A record number of straws (3,313) was processed in November (compared with a target of 2,668). The re-organization referred to above raises the target to 3,600 per month.

Radiator Packs

Production was moved to Indiana University. Production was ahead of schedule at the time of moving.

Dividers

Production continued with no special difficulties.

Wire Supports

Production continued with no special difficulties.

Capacitor Barrels

Produced as needed for tension-plate processing.

Tension Plates

These are now processed as needed to create HV plate/TP kits. All tension plates have arrived from Krakow.

HV plate testing and assembly with tension plates

Production continued with no special difficulties.

Capacitor Assembly

No activity this month. The final decision on capacitor type has not been made.

1.2.1.1.3.1.1.8.5, 6 Gas connections

Active gas fittings are produced as needed for TP/HV kits.

1.2.5 TRT Electronics

1.2.5.1 ASD/BLR

1.2.5.1.2 Prototype

Milestone	Baseline	Previous	Forecast	Status
ASDBLR Design Frozen	13-Jul-01	15-Nov-01	15-Jan-02	Delayed (See #1)
Production Readiness Review	11-Jan-02	11-Jan-02	15-Jan-02	Delayed (See #2)
Start Production	18-Jan-02	--	18-Jan-02	Delayed (See #3)

Note #1 The new "properly processed" wafers arrived in mid July and plastic packaged parts were delivered on the 31st. Preliminary measurements indicate that matching and other functionality is as expected (hoped), however, the noise measurements are not as good as the SPice simulations would have indicated. We now believe we understand the cause of this discrepancy and have submitted metalization changes to ATMEL that should clear up the effect. Those wafers should be available in early November and so it is possible that we would be able to settle on a final configuration in mid November. This note from the last two months is still the case except that work on completing the DSM blocks has prevented serious noise measurements on the returned ASDBLRs - preliminary yield measurements look good, so we did not screw up big time, but we don't yet know how much we won. Completion of the DSM work in early December means we will be able to make the noise and protection comparisons by Xmas. We still need to settle on a final PRR date, but these should all come together in Jan 2002.

Note #2 Based on getting noise and input protection information from the remetalled wafers in mid November plus completing all other tests and people availability will put a PRR (or whatever we call it) in mid January or somewhat later - final date will be set after first round measurements. See previous note form a bit more detail.

Note #3 Production could (and should) start ASAP after the PRR in early 02. This is dependent on the review and availability of full funding.

Richard Van Berg (University Of Pennsylvania)

The revised metalization ASDBLR wafers were returned by ATMEL and half of them have been packaged in TQFP packages. Using a slightly modified TB3 board we have started to make precision noise measurements of the revised chip. At the moment only one device has been measured, but we know that a) the metal changes to all channels were successful, b) the noise is significantly lower in all channels than the ASDBLR00 version and some channels are better (as expected) than others, and c) the spice models used are in some way inaccurate since the measured noise is still above the calculated noise. The noise figure does seem to be directly dependent on the area of input protection diode(s) in each channel and, as expected, the presence or absence of on chip resistance.

While we need to make a lot more measurements (including the strength of the remaining input protection) it is fairly clear that we have understood the basic "cause" of the increased noise and have an array of options from which we can choose a production design that is a suitable compromise between noise and input protection strength. This is compatible with a PRR early in 2002. At the moment we are considering using time in the Feb. TRT week at CERN (since the CERN people are now largely stapled in place).

1.2.5.1.3 Production (Qty = 64,000 + 32,000 Chips)

Milestone	Baseline	Previous	Forecast	Status
Management Contingency Go-Ahead	2-Jul-01	15-Dec-01	15-Feb-02	Delayed (See #1)

Note #1 As noted in the prototyping report, we have preliminary evidence that we understand the ASDBLR noise behavior and thus should be in a position to go ahead with a PRR (or whatever we want to call it) early in 2002. Because of new CERN travel restrictions we may wind up using a day in the Feb. TRT week - slightly later than desired, but maybe not too bad - especially if we can have the paper work ready for all the go-aheads and purchasing steps for a production order prior to that time so that a green light from the review can result in immediate action in procurement.

1.2.5.2 DTM/ROC

1.2.5.2.1 Design **Richard Van Berg (University Of Pennsylvania)**

All DTMROC design effort is concentrated on the DSM version. A final schematic with all blocks final is now in place and a near final layout is converging (we are arguing about pad placement and analog/digital shielding and isolation strategies) - we are unlikely to have finished the final layout and have time to do all the checking and simulation of that layout before the Christmas break, but that is not impossible and, in any event, we hope to have the design files to IBM very soon after CERN recovers from the holiday. Purchase orders from Lund and Penn (using non-project funds) are already in place (this had better work!!) and so we might hope for a DSM wafer return in mid March.

1.2.5.2.2 Prototype **Richard Van Berg (University Of Pennsylvania)**

We have started to measure the DTMROC01 devices that have just returned from the packager (these are the new wafers from the old masks - same wafers as the revised metal ASDBLR01). Preliminary tests seem to indicate that ATMEL did, indeed, improve their process - overall yield has gone from mid 30% to mid 40% and DAC matching is even better than before. So, good news, but maybe not good enough - have to look at costs closely now.

1.2.5.3.1 Design **Richard Van Berg (University Of Pennsylvania)**

The End Cap board design is being handled by CERN right now and the only changes are in adapting the previous design to the slightly different pinout of the xxx00 silicon. That has been accomplished and tests are starting soon.

1.2.5.3.2 Prototype **Richard Van Berg (University Of Pennsylvania)**

New triple flex printed circuits (192 channels of DTMROC) have been produced for CERN. The yield is much higher than before, but still only 50% so some more work in DFM probably needs to be completed. We are shipping chips to CERN now to allow assembly and testing of the boards. Radiation tests on the previous version boards were just completed at the Weizman Institute - results should be forthcoming soon.

1.2.5.4 Common Electronics **Richard Van Berg (University Of Pennsylvania)**

There is a student at Penn working on HV trip sensing circuitry - a very low cost effort so far, but if we get a design and can demonstrate sufficient sensitivity and reliability it will allow a relatively inexpensive HV system to be constructed - within the nominal funds available for 1.2.5.4 (should the collaboration choose to use those funds for that common project).

1.2.5.5 Beam Test

Milestone	Baseline	Previous	Forecast	Status
End of 01 Test Beam	28-Sep-01	--	4-Nov-01	Completed (See #1)

Note #1 Yes, CERN held this schedule. Now we will see how they do on the LHC....

Richard Van Berg (University Of Pennsylvania)

Over for now, was pretty much a success so probably watch this space for next year.

1.2.5.6 System Integration & installation

Milestone	Baseline	Previous	Forecast	Status
System Design Certified	1-Oct-01	1-Jan-02	28-Feb-02	Delayed (See #1)

Note #1 There are really two different systems - the End Cap where we have made great progress, but probably need to have one more round of tests using the 00 (i.e. "final") level silicon. This is waiting on CERN to finish the minor revisions to the boards and so is probably likely around the new year. For the Barrel we have not yet really gotten a viable full design so that must be achieved prior to being able to "certify" it. That process will surely take us beyond the first of the year, but new stamp boards and FBGA packages should be available to start first serious testing at about the new year. This note from last month still applies but I have chivied the date later a bit to be somewhat more realistic.

Richard Van Berg (University Of Pennsylvania)

Most of our effort has been concentrated on the DSM design, but we have completed a series of noise measurements for the old design stamp board vs. position on the snake cable and vs. VDD (+5V). The good news is that there is no position dependence on the snake cable and the VDD dependence is limited to a small number of channels. We need to correct our channel map and then see if we can understand why those particular channels show the dependence. However, the main real activity is waiting for the new design stamp cards with connectors and FBGA packages.

1.3 ARGON

Milestones with changed forecast dates:

1.3.1.5 Assembly & test in West Hall

Milestone	Baseline	Previous	Forecast	Status
Calorimeter Support Structure Complete	31-Oct-01	31-Oct-01	15-Feb-02	Delayed (See #1)

Note #1 Changes required to Paris design. Not on critical path.

1.3.2.1.3 Production

Milestone	Baseline	Previous	Forecast	Status
Last Pin Carrier Delivery	1-Mar-01	1-Feb-02	1-Nov-30	Completed
54 FT Complete	17-Dec-01	17-Dec-01	10-Jan-02	Delayed (See #1)

Note #1 Slight delay due to welding/testing work on barrel installation

1.3.2.2.3 Production

Milestone	Baseline	Previous	Forecast	Status
2 Complete HV Feedthrough Ports	1-Mar-01	20-Jan-02	20-Feb-02	Delayed (See #1)

Note #1 The order of installation of HV and signal FT has been changed. HV cables will be installed after completion of signal FT installation.

1.3.3.1.4 Installation @ Testing CERN

Milestone	Baseline	Previous	Forecast	Status
Installation @ Testing CERN Start	1-Mar-02	1-Mar-02	1-Mar-03	Delayed (See #1)

Note #1 The completion date matches new ATLAS schedule.

1.3.5.1.3 Production (QTY=30000)

Milestone	Baseline	Previous	Forecast	Status
Start Preamp Deliveries to FEB	3-Sep-01	1-Apr-02	29-Nov-01	Completed

1.3.9.1.1 Design

Milestone	Baseline	Previous	Forecast	Status

Reconstruct E, T, and chi square for TB data	12-Feb-01	1-Nov-01	1-Mar-02	See Note #1

Note #1 Done, not completely reviewed.

1.3.1 Barrel Cryostat

1.3.1.5 Assembly & Test in West Hall

Milestone	Baseline	Previous	Forecast	Status
Final Cryostat Acceptance (KHI-CERN)	31-Aug-01	--	15-Feb-02	Delayed (See #1)
Calorimeter Support Structure Complete	31-Oct-01	31-Oct-01	15-Feb-02	Delayed (See #2)

Note #1 Provisional acceptance and transfer of ownership to CERN completed. Final acceptance awaits completion of chimney weld repair. Discussions with CERN TIS re method of repair not yet complete.

Note #2 Changes required to Paris design. Not on critical path.

1.3.2 Feedthrough

1.3.2.1 FT-Signal

1.3.2.1.3 Production

Milestone	Baseline	Previous	Forecast	Status
Last Pin Carrier Delivery	1-Mar-01	1-Feb-02	1-Nov-30	Completed
54 FT Complete	17-Dec-01	17-Dec-01	10-Jan-02	Delayed (See #1)
Production Complete (68)	15-Feb-02	--	15-Feb-02	On Schedule

Note #1 Slight delay due to welding/testing work on barrel installation

Bob Hackenburg (Brookhaven National Lab.)

In November, FT production hit number 47, with 40 FTs having been shipped to CERN. All Pin carriers have now been delivered and all other components of the project remain in good shape. We have had another two FTs fail electrical tests, and they are being opened.

1.3.2.1.4 Installation

Milestone	Baseline	Previous	Forecast	Status
Installation	17-Jan-01	--	30-Sep-02	Delayed (See #1)
Last Shipment	31-Oct-01	--	30-Aug-02	Delayed (See #2)

Note #1 The completion date matches new ATLAS schedule.

Note #2 The last shipment date matches the new ATLAS schedule. Feedthroughs production will be completed earlier.

Bob Hackenburg (Brookhaven National Lab.)

In November, welding had been halted because of the orbital welder failure, which was sent back to California for repairs. It is now repaired and on its way back to CERN. Meanwhile, another 16 FTs have been tack-welded in place. A total of 40 FTs have now been delivered to CERN.

1.3.2.2 HV Feedthrough

1.3.2.2.3 Production

Milestone	Baseline	Previous	Forecast	Status
2 Complete HV Feedthrough Ports	1-Mar-01	20-Jan-02	20-Feb-02	Delayed (See #1)
Barrel FTs (Electrical) delivered to CERN	1-Jun-01	--	15-Feb-02	Delayed (See #2)
Production Complete	14-Sep-01	--	20-Jan-02	Delayed (See #3)

Note #1, 3 The order of installation of HV and signal FT has been changed. HV cables will be installed after completion of signal FT installation.

Note #2 The delivery will match the installation program.

Michal Rijssenbeek (SUNY Stony Brook)

1.3.2.2.3.1 Warm Connectors

All REDEL/LEMO warm connectors are in hand. The first HVFT plate, with four Wire Feedthroughs (WFTs) has its warm contacts all crimped, lacquered, and heat shrink tubing applied. We are in the process of making the bundles and mounting the contacts into the warm connectors.

1.3.2.2.3.2 Cold Connectors

Cold connectors are in house. Cold connectors will start being used by end December 2001.

1.3.2.2.3.4-5 Filter Modules and Filter Crate

All HV parts have been delivered. Filter daughterboards are in house. All module front and back panels have been made in the Stony Brook department machine shop. Test versions of the filter motherboard are being made.

1.3.2.2.3.7-9 Vacuum Components for the High Voltage Feedthrough (HVFT)

All eight HVFTs have been welded and tested at BNL. That finishes all HVFT mechanical/cryogenic work. The first HVFT was installed on Oct 10 on the Barrel Cryostat A-side. The second Barrel FT has been welded (Dec 10) on the cryostat C-side.

1.3.2.2.3.10 Assembly

The EM Calorimeter builders requested that one spare wire be included in each 7-wire HV bundle, in order to provide separate HV supply for sick calorimeter cells found during calorimeter module testing. This caused a re-mapping of the HV connection diagram, and subsequent rebundling of the HV wires. We plan to finish the re-bundling of the first HVFT plate by end December 2001. Then, a final HV and leak test will be done, using the actual feedthrough. At that time the bundle insertion procedure will be tested as well.

A re-mapping of the EMEC and PSEC wiring is under consideration at this time: we have made a proposal that provides two spare wires per set of three HV 8-pin connectors.

1.3.2.2.4 Installation

Milestone	**Baseline**	**Previous**	**Forecast**	**Status**
Ship End-Cap C to CERN	5-Mar-01	--	20-Feb-02	Delayed (See #1)
Installation HVFT ports on Endcap C	5-Sep-01	--	25-Mar-02	Delayed (See #2)
Barrel Install Complete	1-Nov-01	--	20-Mar-02	Delayed (See #3)
Installation HVFT on Endcap C complete (mechanical)	1-Nov-01	--	20-Mar-02	Delayed (See #4)
Ship End-Cap A to CERN	1-Feb-02	--	1-Mar-02	Delayed (See #5)
Installation HVFT on Endcap C complete (Cables)	20-Feb-02	--	20-Apr-02	Delayed (See #6)
Install HVFT on Endcap A complete (Cables)	28-Feb-02	--	28-Apr-02	Delayed (See #7)
Install HVFT on Endcap A complete (mechanical)	28-Feb-02	--	28-Mar-02	Delayed (See #8)

Note #1 Shipment combined with signal FT. Delay driven by cryostat availability.

Note #2, 5, 7, 8 Delay will match the cryostat availability.

Note #3 The order of installation of HV and signal FT has been changed. HV cables will be installed after completion of signal FT installation.

Note #4 Delay will match the cryostat availability. The order of installation of HV and signal FT has been changed. HV cables will be installed after completion of signal FT installation.

Note #6 The order of installation of HV and signal FT has been changed. HV cables will be installed after completion of signal FT installation. Will match cryostat availability.

Michal Rijssenbeek (SUNY Stony Brook)

Both barrel cryostat feedthroughs have been welded onto the cryostat by CERN and BNL personnel. Tefzel cable mounts, tefzel cable ties, and M5 SS bolts are at CERN and available for cable routing. Shipping of the first Barrel HVFT plate with wire bundles is foreseen for the first week of January 2001.

We will install the HV cable tree and do the HV wire routing when all welding has finished, and after cleaning of the cryostat (i.e. with the signal FT cables in place). This second phase of installation is foreseen for January 14, 2002.

1.3.3 LAr Cryogenics

1.3.3.1 LN2 Refrigerator System

1.3.3.1.3 LN2 Ref. System Fabrication

Milestone	Baseline	Previous	Forecast	Status
Ln2 Ref. System Fabrication	1-Jun-01	--	1-Sep-03	Delayed (See #1)

Note #1 The completion date of system installation matches new ATLAS installation schedule.

1.3.3.1.4 Installation @ Testing CERN

Milestone	Baseline	Previous	Forecast	Status
Installation @ Testing CERN	1-Mar-02	--	1-Oct-03	Delayed (See #1)
Installation @ Testing CERN Start	1-Mar-02	1-Mar-02	1-Mar-03	Delayed (See #2)

Note #1-2 The completion date matches new ATLAS schedule.

1.3.3.2 LN2 Quality Meter System

1.3.3.2.3 Quality Meter Production

Milestone	Baseline	Previous	Forecast	Status
Parts and Material Start	29-Aug-01	--	15-Jan-02	Delayed (See #1)
Quality Meter Production	1-Oct-01	--	30-Jun-02	Delayed (See #2)
Assembly Start	26-Dec-01	--	26-Jun-02	Delayed (See #3)
Machining and Welding Start	26-Dec-01	--	26-Jun-02	Delayed (See #4)
Tests and calibration Start	26-Dec-01	--	26-Dec-02	Delayed (See #5)
Parts and Material Complete	28-Dec-01	--	28-Aug-02	Delayed (See #6)
Assembly Complete	26-Apr-02	--	26-Apr-02	On Schedule
Machining and Welding Complete	26-Apr-02	--	26-Apr-02	On Schedule
Tests and calibration Complete	26-Apr-02	--	26-Apr-02	On Schedule

Note #1, 3-6 Delay matches the new ATLAS schedule. Not on critical path.

Note #2 Delay matches the new ATLAS schedule.

1.3.4 EM Electronics/MB System

1.3.4.1 Readout Electronics

1.3.4.1.3 Production

Milestone	Baseline	Previous	Forecast	Status
Indust Purchase Last Delivery	1-Mar-02	--	1-Mar-02	On Schedule

1.3.4.2 Motherboard System

1.3.4.2.3 Production

Milestone	Baseline	Previous	Forecast	Status
Last Delivery of SB & MB PC Boards	1-Dec-01	--	1-Nov-02	Delayed (See #1)
Shipment of Batch 13 boards	1-Dec-01	--	1-Dec-01	On Schedule
50% MB System Production Complete	2-Dec-01	--	2-Dec-01	On Schedule
Shipment of Batch 14 boards	15-Dec-01	--	15-Dec-01	On Schedule

Note #1 Matches the module construction schedule

1.3.5 Preamp/Calibration

1.3.5.1 Preamps

1.3.5.1.3 Production (QTY=30000)

Milestone	Baseline	Previous	Forecast	Status
Start Preamp Deliveries to FEB	3-Sep-01	1-Apr-02	29-Nov-01	Completed
Final Production Complete	29-Mar-02	--	29-Mar-02	On Schedule

Hong Ma (Brookhaven National Lab.)

IO-826: Receive 384 from vendor since last report.

384 are being tested. 3186 have been completed and ready for shipment. Ave Yield=97.4%

IO824: Received 1824 from vendor since last report

1632 are being tested. Average Yield=98.7%3319 are ready for shipment, 70 have been shipped.

IO823: Received 288 from vendor since last report

All have been tested. Ave Yield=99%. 8470 are ready for shipment, 170 have been shipped.

1.3.6 System Integration

1.3.6.1 Pedestal

1.3.6.1.3 Production

Milestone	Baseline	Previous	Forecast	Status
Start Barrel Pedestal Delivery to CERN	31-Dec-01	--	1-Mar-02	Delayed (See #1)
Start EC Pedestal Delivery to CERN	31-Dec-01	--	1-Mar-02	Delayed (See #2)
Start Ped.s deliveries Ship In Place	31-Dec-01	--	31-Dec-01	On Schedule
25% Pedestals Delivery from Vendor Compl	30-Jan-02	--	30-Jan-02	On Schedule
25% Bar & EC Ped.'s Deliveries to CERN Compl	29-Mar-02	--	29-Mar-02	On Schedule
50% Pedestals Delivery from Vendor Compl	29-Mar-02	--	29-Mar-02	On Schedule
25% Pedestals Deliveries Ship in Place	30-Apr-02	--	30-Apr-02	On Schedule

Note #1-2 Delay matches installation schedule.

1.3.6.2 Cables/Base Plane

1.3.6.2.3 Production

Milestone	Baseline	Previous	Forecast	Status
1st Delivery Date to CERN	31-Dec-01	--	30-Mar-02	Delayed (See #1)
1st Delivery Ship in Place	31-Dec-01	--	31-Dec-01	On Schedule
25% Deliveries Complete	30-Apr-02	--	30-Apr-02	On Schedule
25% Deliveries Ship in Place	30-Apr-02	--	30-Apr-02	On Schedule

Note #1 Warm cables to be shipped with crate.

1.3.6.3 Crate-Mechanical

1.3.6.3.3 Production

Milestone	Baseline	Previous	Forecast	Status
25% Crates Deliveries from Vendor Compl	30-Jan-02	--	30-Jan-02	On Schedule
25% Crates Delivered to CERN	29-Mar-02	--	29-Mar-02	On Schedule
50% Crates Deliveries from Vendor Compl	29-Mar-02	--	29-Mar-02	On Schedule
25% Crates Ship in Place	30-Apr-02	--	30-Apr-02	On Schedule

1.3.6.4 Power and Services

1.3.6.4.3 Production

Milestone	Baseline	Previous	Forecast	Status
25% Bus Bars Delivered from Vendor	30-Jan-02	--	30-Jan-02	On Schedule
50% Bus Bars Delivered from Vendor	29-Mar-02	--	29-Mar-02	On Schedule

1.3.6.5 Cooling

1.3.6.5.3 Production

Milestone	Baseline	Previous	Forecast	Status
Cooling Liquid Decision	17-Dec-01	--	17-Dec-01	On Schedule

1.3.7 Front End Board

1.3.7.1 FEB

1.3.7.1.2 Pre-Proto/Mod 0/Atlas Prototype

Milestone	Baseline	Previous	Forecast	Status
1st Delivery of Layer Sum Boards	2-Jul-01	--	1-Jan-02	Delayed (See #1)
Start Assembly	11-Sep-01	--	11-Nov-01	Completed (See #2)
Rad Hard. - All Components	28-Sep-01	--	28-Feb-02	Delayed (See #3)

Note #1 Delayed until boards are needed for rad-tol FEB production.

Note #2 Delayed due to the delay in the Critical Design Review.

Note #3 Delayed due to late delivery of rad-tol voltage regulators.

John Parsons (Columbia University)

The first rad-tol ATLAS FEB prototype was assembled. Testing began, and is proceeding well. So far, all functional tests have been successful.

The FEB is still missing the rad-tol Vregulators. Pre-release samples of the positive regulators are expected early Dec. and will be added to the FEB. Negative regulators are expected in March. 02.

1.3.7.1.5 Radiation Testing

John Parsons (Columbia University)

A run at Harvard in November was used to irradiate additional FEB component samples, and also new optical transmitter modules from Taiwan. The new transmitters passed the radiation qualification.

1.3.7.2 SCA

1.3.7.2.1 Design **John Parsons (Columbia University)**

The SCA PRR was passed on Nov. 12. The initial order, for 200 wafers, is being placed with ATMEL.

1.3.7.4 Optical Links

1.3.7.4.1 Design **John Parsons (Columbia University)**

A modified design for the optical transmitter was produced by Taiwan, with the aim to solve the previously observed lack of radiation tolerance. The new design was irradiated, and meets the specs.

The Single MUX chip was received and successfully tested. One will be installed on the FEB to verify its integration there.

The link PRR will take place in Feb. 2002.

1.3.7.4.2 Prototype/Module 0

Milestone	**Baseline**	**Previous**	**Forecast**	**Status**
Optical Links ATLAS Prototype	1-Jun-01	--	1-Jun-02	Delayed (See #1)

Note #1 Prototype completed and tested. FEB-end integrated with the layout. ROD-end will depend on the ROD design.

1.3.8 Trigger Summation

1.3.8.1 Layer Sums

1.3.8.1.3 Production (Qty = 3,441 Boards)

Milestone	**Baseline**	**Previous**	**Forecast**	**Status**
Start Deliveries to FEB (ORSAY/Nevis)	2-Jul-01	--	1-Jan-02	Delayed (See #1)

Note #1 Delivery will be started to Nevis only when requested.

Bill Cleland (University Of Pittsburgh)

During the month of November, an additional 211 LSBs have been tested. All of the S8x2 LSBs have now been completed. We are now in the stage of repairing boards that have failed acceptance tests, adding resistors to special versions of the board, etc. This work will essentially be finished by the end of the year.

1.3.8.2 Interface to Level 1

1.3.8.2.1 Design/Electronic Tooling/Comp. Specs

Milestone	Baseline	Previous	Forecast	Status
Circuit Design of ATLAS receiver Complete	12-Aug-01	--	30-Jan-02	Delayed (See #1)
Final Design Complete	4-Oct-01	--	30-Mar-02	Delayed (See #2)
Critical Design Review	12-Dec-01	--	30-May-02	Delayed (See #3)

Note #1 The investigation of a lower noise solution to the variable gain amplifier in the receiver signal chain has led to a delay of about 6 months in the design of the system. The amplifier has now been chosen, and the layout of the prototype is now under way.

Note #2 It is likely that this milestone will be missed by a few months, due to the delay arising from the study of the variable gain amplifier mentioned above.

Note #3 This milestone has slipped, since the production of the prototype module is delayed.

Bill Cleland (University Of Pittsburgh)

During the month of November, we have made the final decisions on the variable gain ADC and other design choices. We are now laying out the final VGA daughterboard. A 4-channel "slice" of the complete analog chain is also being built, to study the properties of the various components.

During a visit to Heidelberg, we have agreed that the prototype receiver module can be added to the L1 "slice" tests, which includes the preprocessor module (containing the ADC), followed by the trigger processor modules. This should happen sometime during the summer of 2002.

1.3.8.2.3 Production (Qty - 187 Boards)

Milestone	Baseline	Previous	Forecast	Status
Production Readiness Review	4-Mar-02	--	4-Oct-02	Delayed (See #1)
Start Production	4-Mar-02	--	4-Nov-02	Delayed (See #2)
PM Appr of RCV/Mon Bds Purch Req.'s	18-Mar-02	--	18-Nov-02	Delayed (See #3)
RCV/Mon Bds RFP Issued	4-Apr-02	--	4-Apr-02	Delayed (See #4)

Note #1 The Receiver system design has been delayed by about 1 year as discussed above. The design review should be held at the end of 01, and we anticipate holding the PRR in Oct of 02.

Note #2 We will start production once the bid has been selected.

Note #3 We anticipate approval of the PM to proceed with production shortly after the PRR.

Note #4 The bids will be issued shortly after the PRR.

1.3.9 ROD System

1.3.9.1 ROD Board

1.3.9.1.1 Design

Milestone	Baseline	Previous	Forecast	Status
Reconstruct E, T, and chi square for TB data	12-Feb-01	1-Nov-01	1-Mar-02	See Note #1
Complete Code to form averages of Cal.	18-Jun-01	--	1-Mar-02	See Note #2
Complete Code to get OFC from CAL. Data	4-Sep-01	--	1-Mar-02	See Note #3
Real time evaluation of optimal filter coeff.	3-Dec-01	--	1-Apr-02	See Note #4
Conceptual Design Reivew	15-Jan-02	--	1-Jun-02	See Note #5

Note #1 Done, not completely reviewed.

Note #2-4 Calibration procedure not completely defined.

Note #5 Tests with new C64 DSP will start in Jan 02.

Rod Engelmann (SUNY Stony Brook)

BNL/Stony Brook - ROD demo tests: the high trigger rate

(<~ 100kHz) runs with the ROD equipped with one PU were continued.

A VME 64 extension was installed and work to check the ROD with a logic analyzer was begun. A simulation package with overlay of noise and pileup onto Geant electrons is being debugged (resurrected from a previous version which ran on the Atlas Unix cluster to work on the LINUX Atlas LINUX cluster).

Nevis: LAP and Nevis finished the design of the PU with the new TI C64 DSP which is to be tested in the existing small motherboard at Nevis and the ROD Demonstrator Board at LAPP and later at BNL.

1.3.9.1.2 Prototype

Milestone	Baseline	Previous	Forecast	Status
Decision Taken on Processor Hardware	10-Dec-01	--	10-Jun-02	See Note #1

Note #1 New conceptual design separates processor hardware from mother board. This allows for evaluation of new DSP

1.3.9.1.3 Production Qty = 500

Milestone	Baseline	Previous	Forecast	Status

Management Contingency Go-Ahead	30-Apr-02	--	30-Apr-02	On Schedule

1.3.10 Forward Calorimeter

1.3.10.1 FCAL1 Module

1.3.10.1.3 Production

Milestone	Baseline	Previous	Forecast	Status
FCAL1-C Interconnects Complete	30-Apr-01	--	30-Dec-01	Delayed (See #1)
FCAL1-A Matrix Plate Inspection-1	10-Dec-01	--	10-Dec-01	On Schedule (See #2)
FCAL1-C Module Complete	15-Mar-02	--	15-Mar-02	On Schedule (See #3)
Delivery 2nd half - FCAL1-A	18-Mar-02	--	18-Mar-02	On Schedule (See #4)
FCAL1-A Matrix Plate Inspection-2	25-Mar-02	--	25-Mar-02	On Schedule (See #5)

Note #1 Half the regular interconnects are completed. The other half will be completed early next year. The small number of irregular interconnects are being laid out now.

Note #2 All except the two end plates have been acceptance tested and measured.

Note #3 We still hope to make this date.

Note #4 The two end plates should arrive in December. They were delayed from the accelerated schedule (not accounted for in these milestones) due to change orders.

Note #5 All but the end plates are completed. It should take only a few days after delivery to complete this.

John Rutherfoord (University Of Arizona)

FCal Construction:

Several considerations outside the control of the FCal group could delay the FCal construction project compared to the present schedule which is compatible with the ATLAS LArG Schedule. We believe that the FCal1 modules and the cold electronics will be ready on time. However the FCal2 and FCal3 modules, being constructed in Canada, must also be ready so that the final assembly in the Jura-side clean-room in the North Area at CERN can start on schedule. While the Canadian teams are presently on schedule the delivery of tungsten rods still threatens their construction schedule. These rods, the responsibility of Russia, are throttled by the Russian funding profile and do not meet the LArG schedule. So ways to advance funding to Russia have been explored and solutions are being attempted. Recently Marzio Nessi found some funds to accelerate the Russian production of tungsten rods in 2002.

Over the years as the dollar grew stronger, the Russian commitment shrank so that they now can commit to only tungsten rods for FCal2C, FCal2A, and FCal3C. So we have sought an alternate supplier for

FCal3A rods. Colleagues at Nanjing University in China and two other close-by Chinese universities are eager to help and are applying for funding from their national funding agency. Should they succeed then they will be able to supply the missing rods. In the meantime they have identified an industrial manufacturer capable of this job. They have already arranged for samples and nearly half the remaining rods to be produced. These were financed by a loan from ATLAS with a guarantee from Canada, should the Chinese not receive their grant. So, with luck, the tungsten rod problem will soon be solved.

The next schedule concern is the availability of the aluminum support tube into which the FCal modules (and Plug3) are inserted. This support tube is a part of the endcap cryostat and is needed early in the FCal final assembly procedure. As the endcap cryostats fall further behind schedule the support tube becomes more of an issue for us. If the endcap C cryostat arrives on 11 February 2002, as presently scheduled, we estimate the support tube will be available about 6 to 7 months later. (The support tube is required during cryostat testing after the feedthroughs are welded into the cryostat.) Any delay beyond the present schedule will delay the FCal final assembly. However we just realized a way to delay the time the support tube must be available to us by modifying some procedures in our final assembly, allowing for a bit more delay before the support tube becomes the critical item.

While still far from the critical path, the Plug3, a common project item contributed by Australia and designed and managed by Arizona, is delayed at CERN. Bids were received and a winner determined earlier this year. An order could have been placed last summer. But no one at CERN is responsible for the paperwork to get this order out the door. With some pushing from our side there is a chance that this order will be placed before the end of the year.

The H1 cryostat in which we will conduct module cold tests upon delivery of the modules to CERN is in heavy use by the HEC community so scheduling is a challenge. We are trying to arrange for a slot in their schedule so that we can perform these tests without delay.

The Jura-side clean room in the North Area is also heavily scheduled. When we agreed to re-locate our final assembly phase from the very crowded Building 180 to the North Area we asked for some guarantee that the space would be available when we needed it. But not knowing the exact date we needed it meant that the agreement was less than crisp. Should the previous occupant be slow to vacate when we arrive this could upset our schedule.

Another worry, already pointed out earlier, is our calibration test beam run of the FCalA assembly in late 2003. Assuming the test beam run year in 2003 is similar to past years, then we will be ready for this test right at the end of the scheduled beam time. Any delay would mean that we would have to wait until the startup of beam in 2004 or to forego the test. A related concern is the warm electronics for this calibration test. Because the FCal group is small and very busy building the modules we worried that managing the readout electronics without help from the experts would be more than we could manage. We've done this for all previous beam tests but we used relatively simple readout electronics which we built ourselves. Bill Cleland and John Parsons recently realized that they will want to conduct FEC tests with the production FEBs about the time we are doing our calibration test beam run, assuming we do it as per our present schedule. And since the EMB and EMEC are settled into a run program with the present test beam electronics and won't want to change, the FCal offers the opportunity to test the final electronics in a nearly real situation. This is a happy realization for the FCal group because it means that we would get some help from the experts while preparing for and conducting our calibration test beam run. But should our schedule slip, then their enthusiasm for using the FCal as a test bed will wane.

FCal1 Module:

Rod insertion started just before the end of November. This is the last big phase of module production and we allowed more than three months in the schedule. We believe that we can do this two to three times faster than we allowed in the schedule so we are optimistic that we can complete this phase close to the scheduled time. We estimated that we could insert 120 rods per day. This process includes cleaning the tube (into which the rod is inserted) and inspecting the swab for particulate, cutting and fitting a PEEK fiber to the signal pin in the end of the rod, feeding the rod into a tube in the matrix and winding the fiber about 12 turns on the rod, inserting ground pins at both ends of the module over washers, trimming the PEEK fiber, then HV testing the rod to see if it holds voltage. We apply 600 V to the rod; 250 V is the operating voltage. Very few rods fail this test. For those that fail we extract them, swab the tube, look for a cause, and re-insert the rod. So far we achieved close to 400 rods inserted in one 5-hour shift. We hope to do this routinely after exorcising all the wrinkles in our procedures.

We completed acceptance and characterization tests of all the FCal1A absorber plates. The two end plates are due to be shipped in December. We plan to start cleaning all the FCal1A plates shortly thereafter.

1.3.10.1.4 Installation

Milestone	Baseline	Previous	Forecast	Status
FCAL1-C Received at CERN	1-Apr-02	--	1-Apr-02	On Schedule (See #1)

Note #1 While we expect to finish the module in February we may choose to store the module at Arizona in its shipping container and ship it at the same time as the other FCal modules from Canada in July 2002.

1.3.10.2 FCAL Electronics

1.3.10.2.3 Production

Milestone	Baseline	Previous	Forecast	Status
PCBs received at AZ	21-Nov-00	--	31-Jan-02	Delayed (See #1)

Note #1 We are presently considering a major change from the Rev A board. If we decide to implement this change it will lead to a substantial delay, not yet worked out in detail.

John Rutherfoord (University Of Arizona)

Cold Electronics:

The transmission line transformers are into full production with a shipment almost once a week. We expect the complete order to be filled by mid-December.

We have done detailed cross-talk studies on the prototype summing board and find cross talk only at the connectors. Since the connectors are the prescribed microD connectors there is nothing we can do about this. The peak of the crosstalk is about 1% of the signal on an adjacent channel. However the crosstalk is approximately capacitive so the crosstalk waveform at the peak of the signal is crossing through zero so the size of the crosstalk waveform at the time of the signal peak is nearly zero. But since we record the full signal waveform, this waveform will be distorted by crosstalk away from the peak. We realized that a different ordering of signals on the microD connector would allow us to largely correct for this effect in software but would lead to a delay required to completely lay out the board anew. We hope to make a decision within the week.

We are now into almost routine characterization of the cold cable harnesses. We think we can do two batches per week. If so, this will require only 12 weeks rather than the 24 weeks originally planned. We had a small problem with the HV tests. We had intended to HV test each cable at 600 V (250 V is the nominal) but we had problems with two relays. We thought at first that the relays had welded shut due to sparks at the contacts. But they recovered after we warmed up the cryostat. Nevertheless we decided to test all 64 Axon cables in a cable harness at once. In this way we could take the time to first switch the relays on and then ramp up the HV slowly so that the relays are not required to switch the HV on and off. We do all tests first in the warm, then in liquid nitrogen, and then warm again. We must still verify that our data organization and storage is suitable for long-term use.

1.4 TILE

Milestones with changed forecast dates:

1.4.2.1.3 Production

Milestone	Baseline	Previous	Forecast	Status
100% Tile Deliveries from Russia Compl	2-Jul-01	2-Dec-01	30-Nov-01	Completed

1.4.3.2.3 Production

Milestone	Baseline	Previous	Forecast	Status
3-In-1 Card Test 100% Complete	30-Nov-01	30-Nov-01	1-Mar-02	Delayed (See #1)

Note #1 Routine testing is now complete but repair of faulty cards is in progress. The estimated date for final completion is 1-Mar-02

1.4.4.1.3 Production

Milestone	Baseline	Previous	Forecast	Status
Scintillator procurement	1-Oct-00	1-Dec-01	15-Jan-02	Delayed (See #1)

Note #1 We are making final modifications to the scintillator design. Procurement will follow as soon as final drawings are approved, and funding to buy extension scintillators is available at MSU.

1.4.1 Extended Barrel Mechanics — James Proudfoot (Argonne National Lab.)

Good progress is being maintained on all areas.

Submodule production is now in its final phase. A total of 193 submodules have been constructed at the University of Illinois. Construction is now complete at this location and all remaining parts and components have been shipped to Argonne. 194 submodules have been completed at Argonne. This is now the only location at which submodule construction is active. The remaining work comprises building some additional submodules to replace a small number which have been rejected and in addition for use in Module 65.

46 modules have been mechanically constructed and work on Module 47 is well underway. Extra care is now being taken to ensure that the outer endplates lie within the design envelope.

Module shipping to and from Michigan State University continues without problem. 25 modules have now been sent to MSU and 22 instrumented modules returned from MSU for onward shipping to CERN. A total of 38 modules have now been shipped to CERN. 2 additional modules are undergoing final testing of the optical system and should be shipped in December.

At Argonne, we are continuing to run the cesium source in modules instrumented at Michigan State University. In testing Module 38, the test uncovered some significant number of couplings which fell below the design specification. Following consultation with the Michigan group, it was determined that they would send a crew to perform the repairs. This work has been completed, but the final acceptance test using the cesium will be completed in December (yes it was successful).

Work on the engineering design and analysis of the extended barrel support saddles is continuing. The detailed design of the saddles is complete. An extensive summary of the calculations has been finished in preparation for a PRR to be held in early December.

1.4.1.1 Submodules

1.4.1.1.3 Production

Milestone	Baseline	Previous	Forecast	Status
Submodule Completion (509 Cum)	14-Dec-01	--	14-Dec-01	On Schedule
Submodule Completion (576 Cum)	15-Mar-02	--	15-Mar-02	On Schedule
Submodule Construction Complete	15-Mar-02	--	15-Mar-02	On Schedule

Victor Guarino (Argonne National Lab.)

During the month of November six submodules were constructed. The regular maintenance was performed on the production equipment and no problems were encountered.

Steven Errede (University Illinois-Urbana-Champaign)

In November 2001 we made 3 ATLAS TileCal submodules. We have now made a total of 193 submodules - we made one additional submodule more than was originally specified. We shipped the final 9 fully-completed submodules to ANL in mid-November, thus a total of 193 submodules have now been shipped to ANL. Leftover/spare parts & material, such as master & spacer plates, spring pins, epoxy, the Czech Voudou paint, etc. were also brought to ANL by UIUC personnel.

Thus, we have now completed ATLAS TileCal submodule production here at UIUC. On our UIUC ATLAS TileCal web page, there exist Excel files of some of the statistical analyses we routinely carried out during production to monitor quality control - interested people can access these files at http://web.hep.uiuc.edu/atlas/QC.html

For example, the average submodule height for UIUC ATLAS TileCal submodules after final welding is 291.5 ± 0.1 mm (i.e. ± 100 microns). The average sigma of the average height distribution is 184 ± 25 microns. These distributions are flat across the ~ 2 years of submodule production at UIUC.

UIUC Atlas TileCal personnel are now in the process of carrying out a massive cleanup of our high-bay lab area - it badly needs a thorough cleaning! They are also now helping with ATLAS TileCal PMT testing here at UIUC.

1.4.1.2 Extended Barrel Module

1.4.1.2.3 Production

Milestone	Baseline	Previous	Forecast	Status
Last Delivery of Girders	21-Dec-01	--	21-Dec-01	On Schedule
Module Completion (50 Cum)	31-Jan-02	--	31-Jan-02	On Schedule
Modules Shipped to CERN (40 Cum)	31-Jan-02	--	31-Jan-02	On Schedule

Victor Guarino (Argonne National Lab.)

During the month of November modules #ANL46 and 47 were constructed. These were the last two standard modules. No problems were encountered.

Work also continued on the design and analysis of the support saddles. A production readiness review was scheduled for the extended barrel support saddles for the week of December 10th at CERN. Work was done to summarize the structural analysis and design work that has been done to date in preparation for this review. The documentation for this review can be found at: http://gate.hep.anl.gov/vjg/CERNPRR/index.html

The detailed drawings for the EB and barrel saddles are completed. Extensive structural analysis has also been carried out for three load cases of gravity alone, seismic and gravity loading, and a combination of gravity, seismic, and magnetic loading. Discussion is still occurring over exactly how the saddles will be supported by the air pads and hydraulic jacks and the rails. The method of support is expected to be resolved next month during the review so that the final structural analysis can be completed.

1.4.1.4 Testing

Milestone	Baseline	Previous	Forecast	Status
Modules Source Tested (40 Cum)	31-Dec-01	--	31-Dec-01	On Schedule

1.4.2 Extended Barrel Optics

1.4.2.1 Extended Barrel Scintillator

1.4.2.1.1 Design **Robert Miller (Michigan State University)**

Optical Instrumentation Summary

Instrumentation of the US TileCal extended barrel modules continued on schedule in November. One module was completed at MSU and one was completed at ANL. A total of 41 modules have been instrumented and tested, 37 have been shipped to CERN. Four additional modules are in various stages of production.

1.4.2.1.3 Production

Milestone	Baseline	Previous	Forecast	Status
100% Tile Deliveries from Russia Compl	2-Jul-01	2-Dec-01	30-Nov-01	Completed

David G. Underwood (Argonne National Lab.)

During November we installed tiles in ANL-42. The Cs scans on module ANL-40 had a very low rms, which was partially due to good tile packs and partially due to the fiber installation.

Robert Miller (Michigan State University)

At MSU Module 39 was scanned with the LED source and shipped to ANL in exchange for Module 45. Several bad fibers were replaced in Module 38 at ANL using an aspirin tube that had been specially modified for this purpose. Module ANL-41 was glued and polished. Fibers were inserted and routed in Module 43. Module 45 was prepared for instrumentation.

The final batch of tiles arrived at ANL from CERN and were shipped to MSU in November.

1.4.2.2 Extended Barrel Fibers

1.4.2.2.3 Production **David G. Underwood (Argonne National Lab.)**

At Argonne we installed fibers in module ANL 42. We also worked with MSU on fiber repairs to module 38, which had a number of different problems.

Cs scans were run on modules 42 from ANL and 38 and 39 from MSU.

1.4.2.3 Optical Installation Fixtures

1.4.2.3.3 Production **David G. Underwood (Argonne National Lab.)**

The stands at Argonne for storing MSU modules before shipment to CERN are now set on top of blocks to facilitate the use of the electronics drawer during Cs scans at ANL for Quality Control.

1.4.2.4 Supplies

1.4.2.4.3 Production **David G. Underwood (Argonne National Lab.)**

Argonne received another part of batch 4 tiles. We also received aspirin tubes and laser assemblies. We expect profiles to be shipped soon. There was discussion of delaying profile shipments to the US for a month in early 2002 in order to keep the Barcelona production line going at a higher rate. This would have meant a slowdown of perhaps a month in the US.

Robert Miller (Michigan State University)

The final batch of tiles arrived at ANL from CERN and were shipped to MSU in November. Profile and WLS fibers distribution has been the critical component issue for the past year. During the next four or five months this will become even more difficult, since module assembly is nearly completed at Barcelona and they are attempting to shift manpower to complete the module instrumentation at a faster rate.

1.4.3 Readout

1.4.3.1 PMT Block

1.4.3.1.3 Production

Steven Errede (University Illinois-Urbana-Champaign)

We have spent the month of November continuing to work on getting the Step2 (pulsed light) ATLAS TileCal PMT testing hardware and software operational. We continued to make progress, but we are now into the hard problems of debugging LabView code, which was written by our collaborators. We are in frequent communication with them. We have succeeded in getting the PMT gain vs. HV, PMT dark current vs. HV and Pulse Shape (at nominal HV for Gain = 10^5) to work.

We are currently struggling with getting the final remaining code of PMT linearity PMT ADC counts vs. pulsed LED light level (at nominal HV for Gain = 10^5) to work. We hope to succeed in this soon - we have been making good progress, but did not succeed in this by the end of this month. We discovered that we were missing several LabView sub-VI modules, and also discovered VI's which had bugs in them. As soon as we do succeed in getting STEP2 fully operational here at UIUC, we will begin production STEP2 PMT testing. We can do production STEP2 testing PMTs at a rate of 40 PMTs/day - two grids of 20 PMTs each. This is much faster than the STEP1 (DC light) testing, which takes 2 days/grid of 20 PMTs.

1.4.3.2 Front-end 3-in-1 Card

1.4.3.2.3 Production

Milestone	**Baseline**	**Previous**	**Forecast**	**Status**
3-In-1 Card Test 100% Complete	30-Nov-01	30-Nov-01	1-Mar-02	Delayed (See #1)
3-In-1 Card Final delivery to CERN	1-Mar-02	--	1-Mar-02	On Schedule

Note #1 Routine testing is now complete but repair of faulty cards is in progress. The estimated date for final completion is 1-Mar-02

James Pilcher (University Of Chicago)

As reported previously, production of 3-in-1 cards by the vendor is complete and all cards have been received at Chicago for burn-in and testing.

In November 747 3-in-1 cards completed burn-in and testing and were shipped to CERN. As of the end of November the total number of cards shipped is 9697 or 91% of the total. The monthly average over the 11-month period since burn-in and testing began is now 746 cards per month and our most recent 3-month running average is 740 per month. Our original estimates were for 867 per month.

1.4.3.3 Front-end Motherboards

1.4.3.3.3 Production

Milestone	Baseline	Previous	Forecast	Status
MB Card Test 25% Complete	1-May-01	--	1-Dec-01	Delayed (See #1)

Note #1 Motherboard testing started late because of vendor delays (slow fabrication of bare PCBs and an extra pre-production cycle to confirm specifications). This task is now proceeding at the planned rate but completion is delayed. Completion in Dec/02 still provides over 1.5 years float in the ATLAS schedule.

James Pilcher (University Of Chicago)

As noted previously, all four sections on the Mother Board system together with the control mezzanine board have been manufactured and received at Chicago from the assembly vendor. Work is in progress on burn-in and testing.

In November 29 sets completed burn-in and testing and were shipped to CERN. This brings the total shipped to 61 sets or 23% of the total. Under ideal circumstances the maximum throughput is 32 sets per month.

1.4.4 Intermediate Tile Calorimeter

1.4.4.1 Gap Submodules

1.4.4.1.3 Production

Milestone	Baseline	Previous	Forecast	Status
Scintillator procurement	1-Oct-00	1-Dec-01	15-Jan-02	Delayed (See #1)
Start Scintillator Assembly	1-Dec-00	--	1-Feb-02	Delayed (See #2)
Ship submodules 45-48 to ANL	26-Nov-01	--	26-Nov-01	Completed
Ship submodules 45-48 to BCN	17-Dec-01	--	17-Dec-01	On Schedule
Ship submodules 49-52 to ANL	11-Feb-02	--	11-Feb-02	On Schedule
Ship submodules 49-52 to BCN	4-Mar-02	--	4-Mar-02	On Schedule
Ship submodules 53-56 to ANL	29-Apr-02	--	29-Apr-02	On Schedule

Note #1-2 We are making final modifications to the scintillator design. Procurement will follow as soon as final drawings are approved, and funding to buy extension scintillators is available at MSU.

Kaushik De (University Of Texas At Arlington)

We shipped 2 standard ITC's to Argonne and 2 special ITC's to Barcelona in November, as scheduled. Next months shipment to Barcelona will include the first cut special ITC submodule. We are finalizing the design and plan for these.

We finished testing the latest shipment of 250 PMTs. In December, we will change the hardware back to the configuration for Step 2 testing. We hope that the software has been fixed and will work as advertised this time!

1.4.4.2 Cryostat Scintillators

1.4.4.2.3 Production

Milestone	Baseline	Previous	Forecast	Status
Scintillator procurement	1-Dec-00	--	1-Dec-01	Delayed (See #1)
Start Scintillator Assembly	7-Sep-01	--	1-Feb-02	Delayed (See #2)
Management Contingency Go-Ahead	1-Oct-01	--	1-Oct-02	Delayed (See #3)
Complete CR testing	1-Feb-02	--	1-Dec-02	Delayed (See #4)

Note #1 Scintillator purchase and production of the ITC crack scintillators is delayed pending the decision to authorize this part of the project that was included in the management contingency fund. That decision is scheduled for 1 Oct. 02.

Note #2 Purchase of the mechanical components for the crack scintillators is awaiting final drawing and approval by the ATLAS technical coordination team.

Note #3 Status unknown.

Note #4 Fabrication start is delayed pending management contingency decision.

Robert Miller (Michigan State University)

Production of the ITC fiber assemblies continued during November. Assemblies for standard modules and 4 sets of assemblies for the special type 9 modules were shipped to ANL.

1.5 MUON

Milestones with changed forecast dates:

1.5.4.4.1 CSC1

Milestone	Baseline	Previous	Forecast	Status
4 Chambers Complete	1-May-01	1-Dec-01	15-Feb-02	Delayed (See #1)
16 Chambers Complete	2-Oct-01	30-Apr-02	30-Sep-02	Delayed (See #2)

Note #1-2 This milestone follows the delay in start of construction, which has now started (October 1).

1.5.4.5 CSC Support Structure

Milestone	Baseline	Previous	Forecast	Status
Start Support Structures Construction	3-Jan-01	3-Dec-01	1-May-02	Delayed (See #1)

Note #1 The small wheel fabrication is expected to be launched in May of 2002. The contract and follow-up will be CERN responsibility.

1.5.7.2.1 Faraday Cages

Milestone	Baseline	Previous	Forecast	Status
Finished Faraday Cage Designs	21-Dec-00	22-Nov-01	1-Apr-02	Delayed (See #1)

Note #1 Focus on FC design is now on the HV power feed-in box and the mezz card shield boxes.

1.5.7.2.4 Chamber Analysis

Milestone	Baseline	Previous	Forecast	Status
Finish FEA Modeling	30-Aug-01	30-Nov-01	1-May-02	Delayed (See #1)

Note #1 This work has been delayed because the final wheel structural designs are not yet available. ISTC team to come to CERN in Nov. 01 to complete design.
The design review of the BW took place Nov. 18, 2001 and was successful - with the caveat of several matters of interference to be cleared up. The FEA presented should provide the needed information to complete the integration of chamber mounts with the BW (remarks by FETaylor).

1.5.8.1.3 Integ with Support Structure

Milestone	Baseline	Previous	Forecast	Status
(SM Wheel) CERN Design/FEA Complete	15-Jul-00	1-Dec-01	1-May-02	Delayed (See #1)
(Big Wheel) CERN Design/FEA Complete	1-Feb-01	15-Dec-01	1-May-02	Delayed (See #2)

Note #1 A large fraction of this work has been completed, but as we depend on CERN for the detailed small wheel design from CERN and others for alignment bar and plumbing information we have a delay. Some small progress was made in November. We forecast that this will not be completed until May 1, 2002.
Note #2 Because we depend on CERN for the detailed big wheel design and others for alignment bar and plumbing information we have a delay. We forecast that this will not be completed until May 1, 2002.

1.5.9.1.1 MDT-ASD

Milestone	Baseline	Previous	Forecast	Status
ASD PRR	19-Oct-01	31-Jan-02	1-Apr-02	Delayed (See #1)

Note #1 The ASD prototypes have undergone successful bench testing. The only issue was that the maximum programmable dead time is no larger than the maximum drift time. It is now important to do simulated production testing on a larger number of the chips and to test them out on a chamber with an octal mezz board prototype. The first tests of the octal ASD mounted on a Mezz board are now underway and should be completed by the end of the year. In early 2002 we will be testing octal Mezz boards on actual chambers.

1.5.9.1.2 Mezz PCB

Milestone	Baseline	Previous	Forecast	Status
Mezz PCB Certified	16-Nov-01	31-Jan-02	1-Aug-02	Delayed (See #1)

Note #1 The first octal mezz prototypes have undergone successful bench testing (4x6 boards). The plan is to test these as well as a 3x8 version on actual chambers with a CSM-0 in the first half of 2002. The final testing with a CSM-1 will take place next summer.

1.5.9.2.1 Signal Hedgehog 3X8

Milestone	Baseline	Previous	Forecast	Status
Hedgehog PCB Certified	30-Aug-00	1-Nov-01	1-Mar-02	Delayed (See #1)
Hedgehog Production Complete	28-Feb-01	31-Dec-02	1-Apr-03	Delayed (See #2)

Note #1 Delayed to implement design changes: shortening, coating change, and capacitor vendor switch (Tucsonix to Murata). Final prototype testing was almost complete. However, it has become clear from recent tests that we need to also test a 4-layer version that has shielding planes on both sides. This will be done in early 2002.
Note #2 Production will most likely now take place at CERN starting in the last quarter of 2001. The first production quantities should be available early in mid 2002. Production will continue during 2002 and 2003 in parallel with chamber building.

1.5.9.4 Chamber Service Module

Milestone	Baseline	Previous	Forecast	Status
CSM-1/Octal ASD/MROD Test	1-Dec-01	1-Jul-02	1-Aug-02	Delayed (See #1)

Note #1 Testing will follow CSM-1 prototype completion and will use already tested production mezz boards with AMT-2 and the octal ASD.

1.5.11.1.1 Design

Milestone	Baseline	Previous	Forecast	Status
Preamp/Shaper Final Design Review	2-Oct-01	1-Dec-01	1-Feb-02	Delayed (See #1)
System Critical Design Review	2-Oct-01	1-Dec-01	1-Feb-02	Delayed (See #2)

Note #1-2 Delayed to allow us to verify design modifications to preamp/shaper for yield enhancement, reduced crosstalk, and improved overload recovery. Work along these lines continued in Oct.

1.5.11.1.2 Prototype Electronics

Milestone	Baseline	Previous	Forecast	Status
Preamp/Shaper PRR	1-Apr-02	1-Apr-02	1-Jul-02	Delayed (See #1)

Note #1 More time needed to allow for chamber test and radiation qualification.

1.5.12.2.3 H8 DATCHA

Milestone	Baseline	Previous	Forecast	Status
H8 Operational	24-Nov-00	15-Nov-01	15-Feb-02	Delayed (See #1)

Note #1 A decision was made to use the octant in H8 to validate the ability of the Snezinsk BW design team to predict the behavior of their designs. This means the EM Octant in H8 will be unavailable for mounting alignment devices until the end of January.

1.5.12.4.19 EMS4 (Michigan)

Milestone	Baseline	Previous	Forecast	Status
Ship to Site	3-Apr-02	3-Apr-02	1-Jun-01	Completed

1.5.4 CSC Chambers

1.5.4.4 CSC Construction

1.5.4.4.1 CSC1

Milestone	Baseline	Previous	Forecast	Status
4 Chambers Complete	1-May-01	1-Dec-01	15-Feb-02	Delayed (See #1)
16 Chambers Complete	2-Oct-01	30-Apr-02	30-Sep-02	Delayed (See #2)

Note #1-2 This milestone follows the delay in start of construction, which has now started (October 1).

Venetios Polychronakos (BNL)

One Chamber has been completed; the panels of the second one are already assembled and are being tested for flatness. Fabrication of the panels of the third chamber has started. The first four chambers are expected to be finished by February 15, 1.5 months late with respect to the schedule of ETC01. Fine tuning of the tooling, and adjustments in the procedures were made in preparation for ramping up to full speed production which is now scheduled to be achieved by the first of April assuming that procurement of all parts will have been completed. On the critical path are the cathodes whose procurement package is out for bids.

All 20 cathodes for the first four chambers are being measured on a CMM machine in order to develop an understanding of the achieved tolerances for the lithography as well as hole drilling and trimming precision. The results are being analyzed.

1.5.4.5 CSC Support Structure

Milestone	Baseline	Previous	Forecast	Status
Start Support Structures Construction	3-Jan-01	3-Dec-01	1-May-02	Delayed (See #1)

Note #1 The small wheel fabrication is expected to be launched in May of 2002. The contract and follow-up will be CERN responsibility.

1.5.7 MDT Chamber Production

1.5.7.1 Engineering Management

1.5.7.1.1 Chamber Integration Drawings

Milestone	Baseline	Previous	Forecast	Status
Complete Chamber Integration Drawings	1-Jul-01	--	1-Jun-02	Delayed (See #1)

Note #1 The next series of chamber integration drawings are for the third series of chambers EIS2, EML3 and EMS3. During October the EIS2 drawings were completed and we have stated the EML3 drawings.

The next drawing is for the special (cutout) chamber EMS3. This drawing is in process but completion requires the final spacer frame layout which is supplied by U Washington.

Richard Coco (MIT)

During the November reporting period chamber integration drawings for the next Series 3 production chambers were created and released to the CERN CDD site. These are for chamber EIS2 (BMC) and EML3 (U Michigan).

Integration drawings for these chamber gas supply system and Faraday cage assemblies were also completed and posted to CERN.

1.5.7.1.2 Engineering Documentation — Richard Coco (MIT)

Engineering documentation activities are now focused on the chamber assembly and multi-layer assembly drawings for the Series 3 production chambers. Documentation of the chamber gas system and Faraday cage assembly are also part of the drawings in preparation.

1.5.7.1.4 QA/QC Engineering Support — Richard Coco (MIT)

Engineering continues to provide QA/QC support to the parts procurement activities as well as chamber and multi-layer assembly activities as requested.

1.5.7.1.5 Project Engineering — Richard Coco (MIT)

Project engineering activities focus on supervision of chamber assembly and multi-layer assembly drawings as well as schedule and budget monitoring activities as directed by the Program Manager.

Responsibilities include assisting in monitoring procurement activities and the drafting and review of RFQs issued to potential vendors.

Interfacing with the chamber technical coordinating (TC) activities at CERN and providing engineering support and drawings as required continues as an important function of the PE office.

1.5.7.2 Design of Chambers and Tooling

1.5.7.2.1 Faraday Cages

Milestone	Baseline	Previous	Forecast	Status
Faraday Cage	1-Dec-00	[New]	1-Apr-02	Delayed (See #1)
Finished Faraday Cage Designs	21-Dec-00	22-Nov-01	1-Apr-02	Delayed (See #2)

Note #1 FC design completion is delayed due to slip in the electrical design of the mezz card and HV services to the chambers.

Note #2 Focus on FC design is now on the HV power feed-in box and the mezz card shield boxes.

Richard Coco (MIT)

The Faraday cage design for the four basic type chambers 3x8x8.5°; 3x8x14°; 4x6x8.5° and g4x6x14° have been completed. Open items are the HV service box and mezz card shield box which are also part of the FC.

The HV service box is the point where HV supply to each chamber tube layer will feed into a chamber. Final mechanical design awaits the freezing of the electrical design.

Similarly, the completion of the mechanical design of the Mezz card shielding box is also dependent on the completion of the electrical design of the Mezz card itself.

FC assembly drawings have been posted to CERN-CDD for the EIL 1; EIS 1,2; EMS 5,4 and EML 2, 3 chambers.

1.5.7.2.2 Gas System

Milestone	Baseline	Previous	Forecast	Status
Gas System	1-Jun-01	[New]	1-Mar-02	Delayed (See #1)
gas system	22-Nov-01	--	15-Feb-02	Delayed (See #2)
gas system	22-Nov-01	--	15-Feb-02	Delayed (See #3)

Note #1 On-chamber gas distribution system design is delayed as the proper type of gas feed tubing is determined and purchased.

Note #2 Delay in completing the gas system design is the result of seeking a qualified vendor for the large gas feed tube which distributes gas to the manifold bars.

Note #3 Gas system final design has been delayed due to the need to find a qualified vendor for the large tubing which carries gas to the manifold gas bars.

Richard Coco (MIT)

Gas system assembly drawings have been created and posted to CERN-CDD for the following chambers: EIL 1; EIS 1,2; EMS 5,4,2; and EML 2,3.

Other chamber gas system drawings will be created simultaneously with the related chamber assembly drawings.

1.5.7.2.3 Spacer Frame Design

Milestone	Baseline	Previous	Forecast	Status
Finish Spacer Frame Design	17-Jan-02	--	17-Jan-02	On Schedule

Henry Lubatti (University of Washington)

Colin Daly and Josh Wang continued design work on EIL2/3; they are waiting for the final RASNIK positions from the Boston group that define the position of the holes needed in the cross plates.

The series 3 spacer support assembly jig drawings were posted.

Drawings needed by the Boston group to complete the chamber solid model were sent to Boston.

1.5.7.2.4 Chamber Analysis

Milestone	Baseline	Previous	Forecast	Status
Finish FEA Modeling	30-Aug-01	30-Nov-01	1-May-02	Delayed (See #1)

Note #1 This work has been delayed because the final wheel structural designs are not yet available. ISTC team to come to CERN in Nov. 01 to complete design.

The design review of the BW took place Nov. 18, 2001 and was successful - with the caveat of several matters of interference to be cleared up. The FEA presented should provide the needed information to complete the integration of chamber mounts with the BW (remarks by FETaylor).

1.5.7.2.5 Design of Special Chamber Tooling

Milestone	Baseline	Previous	Forecast	Status
Finish all Special Chamber Tooling	27-Sep-01	--	28-Dec-01	Delayed (See #1)

Note #1 This is largely complete - design of the special components of the Seattle EMS3 chamber was performed by Wellenstein and Mockett et al.

1.5.7.3 Tooling

1.5.7.3.1 Module 0-Precision Tooling

1.5.7.3.3 Series Production Precision Tooling

Milestone	Baseline	Previous	Forecast	Status
Finish Series Production Tooling	1-Feb-01	--	15-Jan-02	Delayed (See #1)

Note #1 Design work for the series 3 production is essentially complete. The tooling design remains off the critical path.

1.5.7.3.5 BMC Tube Assembly Station — Frank Taylor (MIT)

The tube assembly station continues to operate with no major equipment breakdowns.

1.5.7.3.8 BMC Tube Test Station — Frank Taylor (MIT)

An excel file compilation of the tube gas leak batch testing was made. The spreadsheet was installed in the tube room on both the Schublade and the EMMI computer for backup. The graphics and some questions were relayed to the experts. A standard procedure was instigated to record the data in the spreadsheet and to update the graphics.

1.5.7.3.11 BMC Chamber Assembly Station — Krzysztof Sliwa (Tufts University)

At the beginning of the month, sphere blocks and trophy pieces, required for new chamber assemblies at Michigan in 2002, were transported from Tufts to Harvard shop for finishing operations.

Machining of locator pieces, as specified by H. Wellenstein of Brandeis, were completed during the months; the finished parts were delivered at the beginning of December.

Plans are underway for the Tufts shop to carry out machining of a tubelet tester ring and of a number of chamber pieces, according to drawings prepared by the Brandeis group.

Alex Marin (Boston University)

Tooling drawings are available from Brandeis group for the EIS2 chambers. Work on stiffback and layout details (clamping, H blocks, etc) are in progress. HU and BU machine shops will make the necessary tooling components for EIS2 series 2 chambers.

1.5.7.5 Chamber Handling and Shipping Containers

1.5.7.5.2 Chamber Shipping Containers — Richard Coco (MIT)

Shipping container design for the next BMC chamber EIS2 has been completed and released for quote.

To provide adequate clearances, the design used inputs on foam size and orientation as supplied by the technicians who will load chambers into these containers.

1.5.7.6 Common Procurement

1.5.7.6.1 Procurement of Tubes **Tom Fries (Harvard University)**

The following fabrication of the 4th series is complete and in transit to the US sites:

Batch #80 BMC (EIL2)

Batch #76 BMC (EIL3)

Batch #83 UW (EIL4)

1.5.7.6.2 Procurement of Wire **Tom Fries (Harvard University)**

Wire supplies are getting low, but CERN is preparing a 147 km delivery for December.

1.5.7.6.3 Procurement of Endplugs **Tom Fries (Harvard University)**

4,551 NIEF Endplugs were received and distributed among the US assembly sites.

Endplugs present the most critical/ongoing component supply problem.

In March of this year, CERN scheduled for the US to receive 4,600 pieces every 3 weeks. Yet, the actual delivery rate is 4,420/3 weeks! Of the 177k required, we have received only 65k.

1.5.7.6.5 Procurement of Gas Supply System **Tom Fries (Harvard University)**

Tubelets:

The European supplier (Heim) has completed their delivery. We have now received about 90% our total requirements.

However, defects (leaks) have been discovered in the #3 tubelets. Brandeis will be 100% inspecting the #3s to remove the defective parts.

Gas Bars (from UW machine shop):

EMS-2 Type III - 32 bars (8 chamber's-worth) delivered to UW

EMS-4 Type III - 32 bars (8 chamber's-worth) delivered to UM.

Half-Jumpers:

130k were received and distributed among the US assembly sites.

This completes the total US requirements.

1.5.7.6.6 Procurement of Spacer Frame + Attachment **Henry Lubatti (University of Washington)**

During November we completed 20% of the spacer-support structures needed for the EML3 C01-15 chambers, which brings the total fraction completed to 40%.

1.5.7.7 BMC Chamber Construction 104

1.5.7.7.5 EMS1 Series (WBS 1.5.7.7.5) — Frank Taylor (MIT)

About 4974 of the needed 5376 tubes for EIS1 production have been made and passed QA testing. At this time the tubes for EIS1 are about 93 % complete.

Alex Marin (Boston University)

As of Dec 3, Mod 10 EIS1-C base chamber was done. Measurements of the chamber with and without glue strips were done by Peter Hurst. Preliminary data indicated that we have no problems with our procedure of mounting glue strips. The EIS1 chambers, mounted on foam pads (similar to the glue strip mount procedure) were found to be flat within +- 5 microns (note that those errors are within the flatness of the granite table!).

Services installation goes slower than expected. There are problems with the components, no final decisions on the gas system components, or on other services installation, including cables.

1.5.7.8 WBS 1.5.7.8 Michigan Chamber Construction 104

1.5.7.8.2 EMS4 Series (WBS 1.5.7.8.2) — Ed Diehl (University of Michigan)

We continued building series 2 chambers (EMS4), completing a total of 13 series 2 chambers by the end of the month. We continue installation of Faraday cage and gasbars & doing chamber gas certification concurrently with chamber production. We have now added a wire continuity test of completed chambers after gas certification to check for wire breakage.

We did some measurements about the possible effects of gluing/not gluing strips on both sides of both multilayers (ML). There had been speculation within the US MDT community that if chambers made with strips on only some ML (as they are now), then chambers might become distorted when operated at 3 atmospheres pressure. We tested one of our EMS4 chambers mounted on a chamber cart for distortion under pressure. We found none. We conclude that we do not need strips on both sides of both ML.

We continued preparations for EML3 retooling. We received the 14-degree angle combs which we'll glue feet on and then survey with the BCAL. We're machining stiffback, spacer frame RASNIK, and other parts.

1.5.7.9 WBS 1.5.7.9 Seattle Chamber Construction 96

1.5.7.9.2 EES2 series* (WBS 1.5.7.9.2) — Henry Lubatti (University of Washington)

During November we completed 1028 drift tubes and put them in the chamber assembly queue.

We unpacked, inspected, and cleaned 600 Menziken aluminum tubes.

During November we assembled and cleaned 600 end plugs

1.5.8 MDT Supports

1.5.8.1 Mechanical Design

1.5.8.1.3 Integ with Support Structure

Milestone	Baseline	Previous	Forecast	Status
(SM Wheel) CERN Design/FEA Complete	15-Jul-00	1-Dec-01	1-May-02	Delayed (See #1)
(Big Wheel) CERN Design/FEA Complete	1-Feb-01	15-Dec-01	1-May-02	Delayed (See #2)
50% Complete	1-Aug-01	--	1-Nov-01	Completed

Note #1 A large fraction of this work has been completed, but as we depend on CERN for the detailed small wheel design from CERN and others for alignment bar and plumbing information we have a delay. Some small progress was made in November. We forecast that this will not be completed until May 1, 2002.

Note #2 Because we depend on CERN for the detailed big wheel design and others for alignment bar and plumbing information we have a delay. We forecast that this will not be completed until May 1, 2002.

Henry Lubatti (University of Washington)

Colin Daly and Josh Wang have continued to press CERN for final design information needed to complete the mechanical integration of the chambers with the support structures.

Colin Daly has begun process to determine final loads of the chambers and their ancillary equipment.

1.5.8.2 Production

1.5.8.2.1 Kinematic Mount Production — Henry Lubatti (University of Washington)

During November we completed kinematic Mount block machining for 90% of EML3 C01-15, 50% of EIS2 C02-16 and 50% of EMS4 C02-16.

1.5.9 MDT Electronics

1.5.9.1 Mezzanine Card

1.5.9.1.1 MDT-ASD

Milestone	Baseline	Previous	Forecast	Status
ASD PRR	19-Oct-01	31-Jan-02	1-Apr-02	Delayed (See #1)

Note #1 The ASD prototypes have undergone successful bench testing. The only issue was that the maximum programmable dead time is no larger than the maximum drift time. It is now important to do simulated production testing on a larger number of the chips and to test them out on a chamber with an octal mezz board prototype. The first tests of the octal ASD mounted on a Mezz board are now underway and should be completed by the end of the year. In early 2002 we will be testing octal Mezz boards on actual chambers.

1.5.9.1.2 Mezz PCB

Milestone	Baseline	Previous	Forecast	Status
Mezz PCB Certified	16-Nov-01	31-Jan-02	1-Aug-02	Delayed (See #1)

Note #1 The first octal mezz prototypes have undergone successful bench testing (4x6 boards). The plan is to test these as well as a 3x8 version on actual chambers with a CSM-0 in the first half of 2002. The final testing with a CSM-1 will take place next summer.

1.5.9.1.3 Mezzanine card/MDT-ASD Test Start George Brandenburg (Harvard University)

The design of the ASD test stand is almost complete. It will be used to test the preproduction batch of 100 ASDs early in 2002.

1.5.9.2 Hedgehog Cards

1.5.9.2.1 Signal Hedgehog 3X8

Milestone	Baseline	Previous	Forecast	Status
Hedgehog PCB Certified	30-Aug-00	1-Nov-01	1-Mar-02	Delayed (See #1)
Hedgehog Production Complete	28-Feb-01	31-Dec-02	1-Apr-03	Delayed (See #2)

Note #1 Delayed to implement design changes: shortening, coating change, and capacitor vendor switch (Tucsonix to Murata). Final prototype testing was almost complete. However, it has become clear from recent tests that we need to also test a 4-layer version that has shielding planes on both sides. This will be done in early 2002.

Note #2 Production will most likely now take place at CERN starting in the last quarter of 2001. The first production quantities should be available early in mid 2002. Production will continue during 2002 and 2003 in parallel with chamber building.

1.5.9.2.3 Hedgehog Card Test Stand Eric Hazen (Boston University)

By agreement of the electronics group, production testing of the signal hedgehog boards will be done by the company producing them (in Italy). They will use a test setup designed at Rome.

Therefore, the test setup constructed at Boston University which was set for testing the 10k hedgehog boards will not be expanded for production testing.

1.5.9.3 CSM-MEZZ Cables

1.5.9.3.1 CSM-MEZZ Cables **George Brandenburg (Harvard University)**

The first test cables have been used successfully with the first octal mezz prototypes. We have several lengths of test cable (up to 6m), and these will be tested to see if there is any difficulty with mounting some CSMs off-chamber.

1.5.9.4 Chamber Service Module

Milestone	Baseline	Previous	Forecast	Status
CSM-1 Prototype	1-Sep-00	--	1-Jun-02	Delayed (See #1)
CSM-1/Octal ASD/MROD Test	1-Dec-01	1-Jul-02	1-Aug-02	Delayed (See #2)

Note #1 The scope of the CSM-1 has changed to a simpler, more robust design. As a result the completion date of the first prototype has moved to spring 02. Work on the design for this more ambitious design is progressing.

Note #2 Testing will follow CSM-1 prototype completion and will use already tested production mezz boards with AMT-2 and the octal ASD.

1.5.11 CSC Electronics

1.5.11.1 ASM1 Boards

1.5.11.1.1 Design

Milestone	Baseline	Previous	Forecast	Status
Preamp/Shaper Final Design Review	2-Oct-01	1-Dec-01	1-Feb-02	Delayed (See #1)
System Critical Design Review	2-Oct-01	1-Dec-01	1-Feb-02	Delayed (See #2)

Note #1 Delayed to allow us to verify design modifications to preamp/shaper for yield enhancement, reduced crosstalk, and improved overload recovery. Work along these lines continued in Oct.

Note #2 Delayed to allow us to verify design modifications to preamp/shaper for yield enhancement, reduced crosstalk, and improved overload recovery. Continued in Sept.

Paul O'Connor (BNL)

Design work continued on ASMI boards for new preamp/shaper chip, mechanical configuration (mounting holes, board sizes, move protection diodes to chamber-side of board). New flex cable for ASMI - ASMII connection was started.

1.5.11.1.2 Prototype Electronics

Milestone	Baseline	Previous	Forecast	Status

Preamp/Shaper PRR	1-Apr-02	1-Apr-02	1-Jul-02	Delayed (See #1)

Note #1 More time needed to allow for chamber test and radiation qualification.

Paul O'Connor (BNL)

Progress was made on the large test bed -- power supplies and injection boards completed, Faraday cage partially completed. Flex cable prototypes were fabricated in BNL shop and tested. First prototype of 25-channel Preamp/Shaper (IC71) was received, mounted on test board and tested. All looks good with this new design. Overload recovery is three times faster than IC50.

1.5.11.2 ASM II Board

1.5.11.2.1 ASM II Board design

Paul O'Connor (BNL)

ASM-IIb board design was completed and sent for fabrication. New ASMII-MUX chip was received and tested, functional with up to 50% margin in clock rate and 30% in supply voltage.

1.5.11.2.2 ASM II Ptorotype

Milestone	Baseline	Previous	Forecast	Status
ASM II /UCI Sparcifier Prototype Interface Integration	1-Apr-02	--	1-Apr-02	On Schedule

Paul O'Connor (BNL)

Progress was made on the VME-DAQ interface. Three out of four FPGA's on the board aren't functional but the first one can transfer data to VME (and thence to PC). Next step is to try to get the transfer rate up and to inject optical data.

1.5.11.5 ROD's

1.5.11.5.2 ROD Prototype

Milestone	Baseline	Previous	Forecast	Status
RODs Final Design Review	4-Mar-02	--	4-Mar-02	On Schedule

David Stoker (University of California Irvine)

During November we continued the incremental assembly and testing of the ROD motherboard. Thermal profiles for soldering the ball-grid array (BGA) connectors were developed. These connectors connect the Generic Processing Units (GPU's), which are DSP modules, to the ROD motherboard and the GPU Test Board.

1.5.11.6 Support Electronics

1.5.11.6.1 Support Electronics Design

Milestone	Baseline	Previous	Forecast	Status
Prelim Design Review	17-Apr-02	--	17-Apr-02	On Schedule

1.5.11.7 Software

1.5.11.7.1 Software design

Milestone	Baseline	Previous	Forecast	Status
S/W Conceptual Design Review	2-May-01	--	15-Jan-02	Delayed (See #1)

Note #1 Development of code external to ROD and documentation not ready for review.

David Stoker (University of California Irvine)

During November, we continued coding of the Sparsifier Processing Unit (SPU) C and assembly code. We also continued developing software for communicating between a PC and the ROD motherboard via VME.

1.5.12 Global Alignment System

Jim Bensinger (Brandeis University)

The month we completed the bar masks for H8 and shipped them to CERN.

Several problems with the BCAMs were uncovered in the H8 test. One in particular was the separation of two sources seemed to vary as the BCAMs were rapidly heated. Although this scenario in unlikely in ATLAS it lead to an understanding of an interesting phenomena. About 10% of the CCD surface is dead space between cells. The interaction of the diffraction pattern and the focusing of the BCAM caused centroid variation as the image moved across the face of the CCD, and the threshold cut in data analysis seemed to be the cause of this problem. The problem has been solved by change the focal point of the BCAM from 1.5 meters to 4 meters.

Other problem was the design of the multiplexer which, under certain load conditions "hot swapping" would generate oscillations on the LVDS lines. This was corrected by increasing the decoupling capacitor.

Ionizing radiation tests were preformed at Pagure (Saclay), France.

We have participated in the review of the big wheel at CERN.

1.5.12.1 Global Design

1.5.12.1.1 Alignment Bars

Milestone	Baseline	Previous	Forecast	Status
Alignment Bar Design Complete	30-Mar-01	--	30-Mar-02	Delayed (See #1)

Note #1 Design for H8 is complete and there is no work on this item at this time. This design will be reviewed following analysis of H8 results. Final design will take place at that time.

Jim Bensinger (Brandeis University)

The measurement of the EM bars was begun at Freiburg.

1.5.12.1.2 Proximity Monitors

Jim Bensinger (Brandeis University)

The bar masks for H8 were produced and assembled at Brandeis and sent to CERN for used in H8.

1.5.12.1.3 Multi-Point System (BCAM)

Milestone	Baseline	Previous	Forecast	Status
BCAM Design Complete	31-Dec-01	--	31-Dec-01	On Schedule
Final Design of Global Align Devices	1-Apr-02	--	1-Apr-02	On Schedule

Jim Bensinger (Brandeis University)

All parts for 100 BCAMs are complete at Brandeis but investigation of the temperature sensitivity of the BCAMs and problems with the circuit boards has delayed assembly and shipping to CERN. A preliminary shipment of 8 BCAMs was made to CERN.

1.5.12.1.4 System Design

Jim Bensinger (Brandeis University)

We participated in the design review of the big wheel. All problems with interference with the alignment system have been resolved. Clearances are such that we can go to an 85-mm bar in the EM and EO layers.

We have begun work on the layout of the survey targets and b-field sensors. We are focusing of the EMS3 chamber since it is the first one to be started in the next round of production.

1.5.12.1.5 DAQ

Milestone	Baseline	Previous	Forecast	Status
DAQ Design Complete	28-Sep-01	--	30-Mar-02	Delayed (See #1)

Note #1 The H8 version basic design is complete. This design will be reevaluated following analysis of H8 data and, if needed, will be revised at that time.

Jim Bensinger (Brandeis University)

The inplane heads have been subject to ionizing doses of 200 and 1000 Gy. These have been brought back to Brandeis and are being tested.

Several problems with the BCAMs were uncovered in the H8 test. One in particular was the separation of two sources seemed to vary as the BCAMs were rapidly heated. Although this scenario in unlikely in ATLAS it lead to an understanding of an interesting phenomena. About 10% of the CCD surface is dead space between cells. The interaction of the diffraction pattern, the focusing of the BCAM caused centroid variation as the image moved across the face of the CCD, and the threshold cut in data analysis seemed to be the cause of this problem. The problem has been solved by change the focal point of the BCAM from 1.5 meters to 4 meters.

Other problem was the design of the multiplexer which, under certain load conditions "hot swapping" would generate oscillations on the LVDS lines. This was corrected by increasing the decoupling capacitor.

1.5.12.2 Operational Test Stands

1.5.12.2.3 H8 DATCHA

Milestone	**Baseline**	**Previous**	**Forecast**	**Status**
H8 Operational	24-Nov-00	15-Nov-01	15-Feb-02	Delayed (See #1)

Note #1 A decision was made to use the octant in H8 to validate the ability of the Snezinsk BW design team to predict the behavior of their designs. This means the EM Octant in H8 will be unavailable for mounting alignment devices until the end of January.

Jim Bensinger (Brandeis University)

Mounting plates to correct for layout errors in the EM octant by Snezinsk were produced and sent to CERN. The struts to hold the EM and EI chambers were produced and measured at Brandeis and sent to CERN. The Univ. of Washington will be responsible for thing in ATLAS but Brandeis did this for H8.

1.5.12.3 Global System Production

Milestone	**Baseline**	**Previous**	**Forecast**	**Status**
Align Bar/Prox Monitors PRR	3-Jan-01	--	31-Mar-02	Delayed (See #1)
Critical System Design Review	3-Jan-01	--	31-Mar-02	Delayed (See #2)

Note #1-2 Not yet scheduled but will follow analysis of H8 results.

Jim Bensinger (Brandeis University)

The part of system production that has begun is that relating to the production of MDT chambers, the inplane system and the camera mounts and mask mounts for the proximity monitors that go on the chambers.

1.5.12.3.1 Alignment Bars

Milestone	Baseline	Previous	Forecast	Status
Bar Production 10% Complete	1-Oct-01	--	1-Jun-02	Delayed (See #1)

Note #1 This is no longer a US responsibility and will be done at Freiburg. Bar production will not begin until after analysis of H8 results.

1.5.12.3.2 Proximity Monitors

Milestone	Baseline	Previous	Forecast	Status
Prox. Production 10% Complete	1-Jan-02	--	1-Jul-02	Delayed (See #1)

Note #1 For final design of the proximity monitors, we must know the position of all components to within 10 mm. Since the layout of ATLAS is not yet final, we are holding the start of production until the layout is final. Production can be completed quickly so this will have no overall schedule impact.

Jim Bensinger (Brandeis University)

We have delivered all the mask and camera mounts for the second round of production to the US production sites. Production of parts for the third round of production has begun.

1.5.12.3.3 Multi-Point System (BCAM)

Milestone	Baseline	Previous	Forecast	Status
BCAM Production Begins	1-Jan-02	--	1-Jul-02	Delayed (See #1)

Note #1 Final BCAM production will not begin until after the PRR. This has not yet been scheduled.

1.5.12.4 MDT Inplane Monitors

1.5.12.4.1 Common Items

Milestone	Baseline	Previous	Forecast	Status
Common Items 25% Complete	1-Jan-02	--	1-Jan-02	On Schedule

Jim Bensinger (Brandeis University)

Almost all of the common parts for the approved MDT chamber production now exists at Brandeis or are mounted on produced chambers.

1.5.12.4.6 EIS2 (Boston)

Milestone	Baseline	Previous	Forecast	Status
Ship to Site	23-Oct-01	--	1-Feb-02	Delayed (See #1)

Note #1 Changes in MDT production schedule has moved this chamber to the third round of production.

Jim Bensinger (Brandeis University)

Design has been completed for chamber specific parts. Production of these parts has begun at Tufts. Lenses exist and have been measured. All other parts exist at Brandeis.

1.5.12.4.13 EML3 (Michigan)

Milestone	Baseline	Previous	Forecast	Status
Ship to Site	10-Dec-01	--	10-Dec-01	On Schedule

Jim Bensinger (Brandeis University)

Design has been completed for chamber specific parts. Production of these parts has begun at Michigan. Lenses exist and have been measured. All other parts exist at Brandeis. The correct name for this WBS time is EML3.

1.5.12.4.18 EMS3 (Seattle)

Milestone	Baseline	Previous	Forecast	Status
Ship to Site	7-Sep-01	--	1-Jan-02	Delayed (See #1)

Note #1 This chamber is not scheduled to be built until the third round of MDT production.

Jim Bensinger (Brandeis University)

This is a special chamber with a cutout. This requires one additional RASNIK line and an additional cross plate. The design for the chamber modification is being done at Brandeis in conjunction with Seattle and the inplane system is part of that design effort. The design for the inplane system is compete and parts are being produced in a local shop.

1.5.12.4.19 EMS4 (Michigan)

Milestone	Baseline	Previous	Forecast	Status

Ship to Site	3-Apr-02	3-Apr-02	1-Jun-01	Completed

1.6 TRIGGER

Milestones with changed forecast dates:

Milestone	Baseline	Previous	Forecast	Status
LVL2 Trigger Prototype Complete	30-Sep-01	30-Nov-01	5-Dec-01	Delayed (See #1)

Note #1 This prototype completion has been delayed to be consistent with the current ATLAS TDAQ schedule. The Phase 2A prototype integration is now expected to be completed at the end of November.

1.6.2.2 Calo Protos

Milestone	Baseline	Previous	Forecast	Status
Prototype Calo Assy Complete	30-Sep-01	30-Nov-01	5-Dec-01	Delayed (See #1)

Note #1 This prototype completion has been delayed to be consistent with the current ATLAS TDAQ schedule. The Phase 2A prototype integration is now expected to be completed at the end of November.

1.6.3.1.4 SCT Design Travel

Milestone	Baseline	Previous	Forecast	Status
SCT for Integ Study Complete	30-Sep-01	30-Nov-01	7-Dec-01	Delayed (See #1)

Note #1 This prototype preliminary exploitation has been delayed until 30-Nov-01 in order to be consistent with the ATLAS TDAQ schedule. The Phase 2A prototype integration is now expected to be completed December 7th, although further delays until early 2002 are likely.

1.6.3.2 SCT Protos

Milestone	Baseline	Previous	Forecast	Status
Prototype SCT Assy Complete	30-Sep-01	30-Nov-01	5-Dec-01	Delayed (See #1)

Note #1 This prototype completion was originally delayed to the end of October in order to be consistent with the current ATLAS TDAQ schedule. The Phase 2A prototype integration is presently expected to be completed during the first week of December.

1.6.4.1.4 Arch. Design Travel

Milestone	Baseline	Previous	Forecast	Status
Prototype Project Assy Complete	30-Sep-01	30-Nov-01	5-Dec-01	Delayed (See #1)

Note #1 This prototype completion has been delayed to be consistent with the current ATLAS TDAQ schedule. The Phase 2A prototype integration is now expected to be completed at the end of November.

Milestone	Baseline	Previous	Forecast	Status
LVL2 Trigger Prototype Complete	30-Sep-01	30-Nov-01	5-Dec-01	Delayed (See #1)
LVL2 Trigger Design Complete	31-Dec-01	--	31-Dec-02	Delayed (See #2)
Start Production	8-Jan-02	--	8-Jan-03	Delayed (See #3)

Start Installation & Commissioning	5-Mar-02	--	5-Mar-03	Delayed (See #4)

Note #1 This prototype completion has been delayed to be consistent with the current ATLAS TDAQ schedule. The Phase 2A prototype integration is now expected to be completed at the end of November.

Note #2 This prototype completion has been delayed to be consistent with the current ATLAS TDAQ schedule. The TDR is scheduled for the end of Dec. '02. This is the earliest date possible for a complete design.

Note #3 This prototype completion has been delayed to be consistent with the current ATLAS TDAQ schedule. The production will start after design is complete.

Note #4 Production will proceed after design and consistent with the current ATLAS TDAQ schedule.

1.6.1 LVL2 SRB **Robert Blair (Argonne National Lab.)**

Progress on the SRB was made on preparations for a review of the preliminary design, fabrication of an S-link "link source card" and software development for the supervisor.

1.6.1.2 SRB Protos **Robert Blair (Argonne National Lab.)**

Templates for design review documents have been obtained from Norman Gee. A similar set of documents will be prepared for an SRB review prior to final design and fabrication. The plan is to prepare documents and arrange for a review sometime around the February Atlas week.

The prototype gigabit ethernet based "link source card" has been assembled. There were problems with the board, a pad was done incorrectly for one of the components, but a workaround (white wires) will suffice for now.

1.6.1.2.1 SRB Protos EDIA **Bernard Pope (Michigan State University)**

Abolins, Hauser and Ermoline attended the ATLAS Trigger/DAQ workshop in NIKHEF, Amsterdam (November 12 - 16). ROD working group activity was concentrated on the preparation of a Market Survey to identify companies able to supply a VMEbus single board computer for use as a ROD Crate Controller. A meeting with the muon ROB designers is being prepared. Dataflow integration activities were also discussed during the Trigger/DAQ week. Abolins gave a presentation on recent results with the Paper Model (work done with Jos Vermeulen).

1.6.1.2.4 SRB Prototype Travel

Milestone	Baseline	Previous	Forecast	Status
Prototype SRB Assy Complete	30-Sep-01	--	30-Mar-02	Delayed (See #1)

Note #1 This prototype completion has been delayed to be consistent with the current ATLAS TDAQ schedule. Since the current prototype SRB may be adequate for early use in the experiment, the level 1 group has suggested that the system undergo more formal design review and documentation prior to production. The current 12U board is adequate for phase 2 tests (if a hardware implementation is regarded as important - this is not yet clear). Tests of the new SRB with level 1 components will not proceed until spring or summer in '02 so this does not delay anything significantly.

1.6.2 LVL2 Calorimeter Trg

1.6.2.2 Calo Protos

Milestone	Baseline	Previous	Forecast	Status
Prototype Calo Assy Complete	30-Sep-01	30-Nov-01	5-Dec-01	Delayed (See #1)

Note #1 This prototype completion has been delayed to be consistent with the current ATLAS TDAQ schedule. The Phase 2A prototype integration is now expected to be completed at the end of November.

1.6.3 LVL2 SCT Trg

1.6.3.1 SCT Design

1.6.3.1.1 SCT Design EDIA

A.J. Lankford (University Of Calif. At Irvine)

Specification of the ROD/ROB interface continued in November. The ATLAS ROD Working Group Readout Link Task Force completed a draft report. The report will be finalized in December. Study of the system implications of a network-based Readout Subsystem (ROS) continued, including consideration of mounting the ROBs on mezzanines on the RODs continued. This topic was discussed at the November TDAQ Workshop. A number of issues were identified for further consideration. The most serious issue concerns operating and maintaining the ROBs if mounted as a mezzanine on the RODs, rather than in separate crates or PCs. It was decided to form a task force to determine if the concept of ROB as a mezzanine on the ROD should be studied further.

Saul Gonzalez (University Of Wisconsin)

The possibility of using the Wisconsin-developed Silicon Kalman tracking algorithm in testing an Event Data Model is being considered (W. Wiedenmann).

1.6.3.1.4 SCT Design Travel

Milestone	Baseline	Previous	Forecast	Status
SCT for Integ Study Complete	30-Sep-01	30-Nov-01	7-Dec-01	Delayed (See #1)

Note #1 This prototype preliminary exploitation has been delayed until 30-Nov-01 in order to be consistent with the ATLAS TDAQ schedule. The Phase 2A prototype integration is now expected to be completed December 7th, although further delays until early 2002 are likely.

1.6.3.2 SCT Protos

Milestone	Baseline	Previous	Forecast	Status
Prototype SCT Assy Compl	30-Sep-01	30-Nov-01	5-Dec-01	Delayed (See #1)

Note #1 This prototype completion was originally delayed to the end of October in order to be consistent with the current ATLAS TDAQ schedule. The Phase 2A prototype integration is presently expected to be completed during the first week of December.

1.6.4 Architecture & LVL2 Global Trigger

1.6.4.1 Arch. Design

1.6.4.1.1 Arch. Design EDIA

A.J. Lankford (University Of Calif. At Irvine)

Work was initiated on specifying a set of standard values for parameters, such as trigger rate and event size, that set the requirements for HLT/DAQ performance. Work continued on developing "strawman" dataflow architectures and test bed configurations to serve as a starting point for performance studies in the integrated prototyping. These topics were discussed at the November TDAQ Workshop and continued in the following weeks. A set of functionality tests for the phase 2A integrated prototype were specified.

ATLAS management asked TDAQ to investigate the feasibility of deferring the purchase of 10 to 15 MCHF of TDAQ components, in order that funds can be redirected to overcosts in the ATLAS Common Projects. These deferrals are in addition to 4 MCHF for Event Filter processors already deferred. Hopefully, new resources can be identified in order to restore the full scope of ATLAS TDAQ prior to initial running. Work on studies of physics menus and trigger selection and a new TDAQ cost model were initiated as part of this feasibility study.

Bernard Pope (Michigan State University)

Work in this area included preparations for various sessions of the NIKHEF TDAQ workshop. During and after the workshop various first cost estimates for the Atlas TDAQ data collection networks were done, in reaction to the requested deferrals from Atlas management.

On the software side various scripts were installed on lxplus.cern.ch for automatic nightly recompilation of all the data collection software. A first version for multicast-based message passing was implemented.

Abolins was elected to the committee to select candidates for the new T/DAQ leadership election. Other members are Klaus Pretzl of Bern and ex-officio Peter Jenni and Leandro Nisati. We have had one phone conference in November with another scheduled in early December after nominations from the membership have been received.

1.6.4.1.4 Arch. Design Travel

Milestone	Baseline	Previous	Forecast	Status
Prototype Project Assy Compl	30-Sep-01	30-Nov-01	5-Dec-01	Delayed (See #1)

Note #1 This prototype completion has been delayed to be consistent with the current ATLAS TDAQ schedule. The Phase 2A prototype integration is now expected to be completed at the end of November.

1.6.4.2 Global Production

1.6.4.2.1 Global Prod Eqmt — Saul Gonzalez (University Of Wisconsin)

The benchmarking studies of Athena, initiated earlier this year, have been finished. The conclusion of this first study is that much work needs to be done in order to validate Athena (and the associated offline software) as an HLT framework. The results of these studies were presented at the NIKHEF TDAQ workshop in early November. A note summarizing the results and establishing a roadmap to full performance is in preparation.